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16. ABSTRACT The report describes a comprehensive computer program which allows the user to simulate a wide range of coal preparation plant configurations and modes of operation. The program was designed to maximize the yield of clean coal while minimizing the impurities. The configuration, mode of operation, and coal feed can be varied to provide solutions to a wide range of problems. The program is written in modular form using standard features of FORTRAN IV language.

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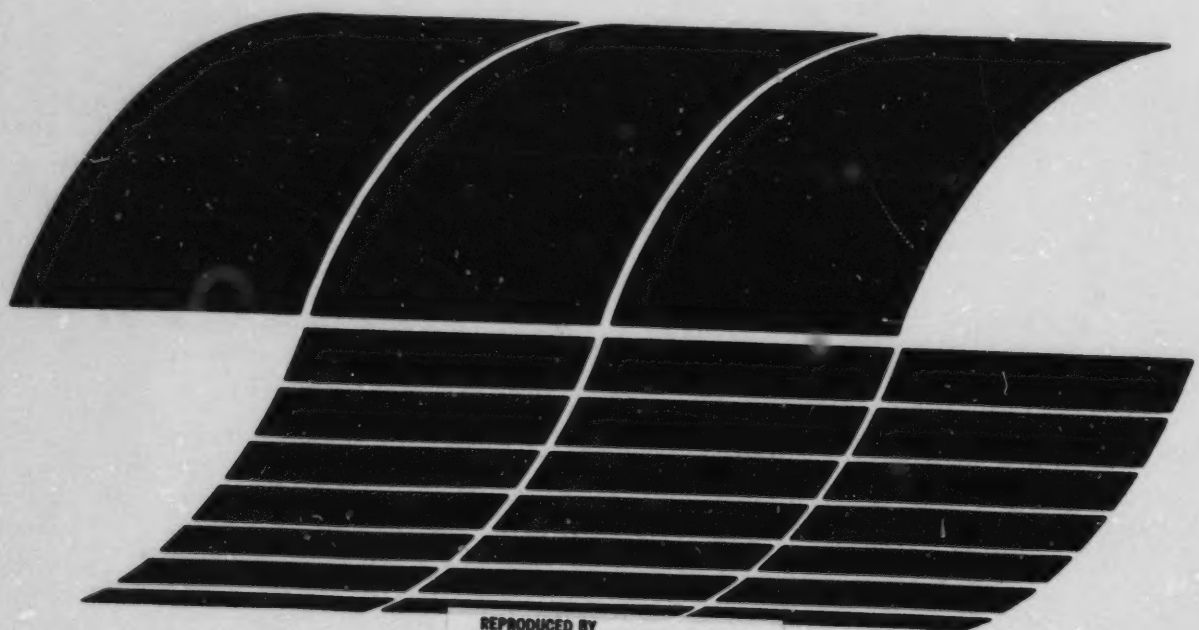

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Computer Simulation of Coal Preparation Plants

by

Byron S. Gottfried

University of Pittsburgh
Pittsburgh, Pennsylvania 15261

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EPA Project Officer: David A. Kirchgessner

Industrial Environmental Research Laboratory
Research Triangle Park, NC 27711

DoE Project Officer: Richard E. Hucko

Division of Solid Fuel Mining and Preparation
Pittsburgh, PA 15213

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1. INTRODUCTION

Coal preparation, commonly known as coal washing, offers a practical and economical approach to the removal of ash and pyritic sulfur from raw coal. For example, the ash in a typical U.S. Northern Appalachian bituminous coal can be reduced from 14 percent to 6 percent and the total sulfur from 3 to 1-1/2 percent by coal preparation (1). Such beneficiation can be obtained at a yield ranging from 60 to 90 percent and at a cost of about $2.90 to $4.83 per ton of clean coal (2).

A typical coal preparation plant consists primarily of various interconnected crushing, screening, washing, dewatering, drying, and thickening units. Several types of washing units will be used, because each piece of washing equipment is best suited for a certain characteristic size fraction of coal. The crushers break the coal into the proper sizes, and the screening units separate the crushed coal into appropriate size fractions. The dewatering and thermal drying units reduce surface moisture to acceptable limits. These various units are interconnected in a number of ways, the choice being dependent upon the characteristics of the coal being processed and the desired degree of beneficiation.

The principal consideration in operating a coal preparation plant is to maximize the yield of clean coal while reducing the impurities to an acceptably low level. In addition, in assessing the possible interconnection of units in an existing plant, or when a new plant is being considered, it is essential that

the optimum configuration be determined for a given degree of cleaning. Usually these matters are handled by some prudent combination of experience and experimentation. A computerized plant simulator, however, is an effective aid in comparing alternatives, provided a program can be developed which is sufficiently comprehensive to simulate conditions found in industrial practice.

This report describes a comprehensive computer program that allows the user to simulate the performance of realistic coal preparation plants. The program is very flexible in the sense that it can accommodate any particular plant configuration that may be of interest. This allows the user to compare the performance of different plant configurations and to determine the impact of various modes of operation with a fixed configuration. In addition, the program can be used to assess the degree of cleaning obtained with different coal feeds for a given plant configuration and a given mode of operation. Thus the user is able to consider a wide variety of alternatives through the use of this simulator.

The simulation program has been written in modular form using standard features of the Fortran IV language. It can therefore be implemented on virtually any large, scientific computer. Use of the simulator requires only that the user specify the appearance of the plant configuration, the plant operating conditions, and a description of the coal feed.

The program has been developed at the University of Pittsburgh, although

the crushing and screening routines were supplied by Automated Process Surveys, Inc. under a subcontract. A close rapport has been maintained with Bureau of Mines personnel throughout the course of this study. Their advice and assistance have been most helpful in the successful completion of the project. In particular, thanks are due to Mssrs. A. W. Deurbrouck and P. S. Jacobsen of the Bruceton, PA Coal Preparation and Analysis Laboratory.

Included in this report are a listing of the computer program, instructions for its use and representative sample output, in addition to a general description of the methods used to carry out the simulation.

2. MATHEMATICAL PROCEDURES

To analyze realistic plant configurations, a computer program must be able to simulate the performance of all principal plant components (namely, crushing, screening and washing units) under specified operating conditions. It should be possible, moreover, to interconnect these units to form whatever configurations may be of interest. Both of these requirements are satisfied in the current simulator. The manner in which the calculations are executed is summarized below.

2.1 Washers

Coal washing equipment makes use of a float-and-sink principle, based upon the specific gravity differences between the coal and its associated impurities. (An exception is the froth flotation process, in which the separation is dependent upon the difference in surface characteristics of the coal and its associated impurities.) The performance of these float-and-sink

units is characterized by a distribution curve, (also called a partition or separation curve). Of the material in the feed having a given specific gravity (ρ), this curve indicates the percentage reporting to the clean coal product (3). A typical distribution curve is shown in figure 1.

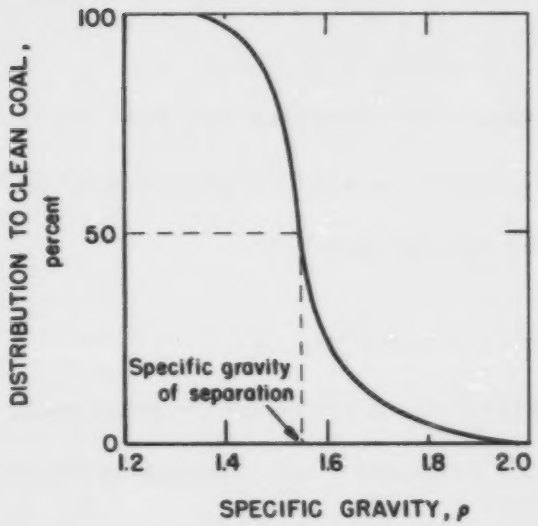


Fig. 1. Typical distribution curve illustrating specific gravity of separation

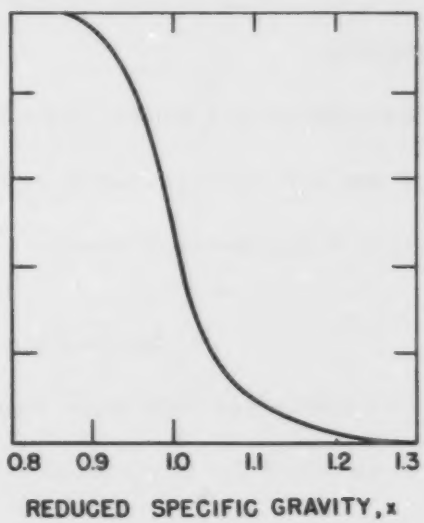


Fig. 2. Typical generalized distribution curve

Notice the value of specific gravity corresponding to an ordinate value of 50, the midpoint. This value is defined as the specific gravity of separation, ρ_{50}; that is, the specific gravity of material in the feed that is divided equally between clean coal and refuse. By making appropriate physical adjustments on a coal washing unit, the value of the specific gravity of separation can be increased or decreased, shifting the distribution curve accordingly. The specific gravity of separation, therefore, is considered a control variable. An increase in the specific gravity of separation results in

an increase in the yield of clean coal but a decrease in its quality.

Recently a method has been developed for representing the distribution curve in a manner that is independent of the specific gravity of separation (4). To do so, the percent of feed reporting to clean coal having a given specific gravity (ρ) is plotted against "reduced" specific gravity, x, rather than specific gravity (ρ). The former is defined as the ratio of specific gravity to specific gravity of separation; that is, $x = \rho/\rho_{50}$. Such a curve is a generalized distribution curve. A typical generalized distribution curve is shown in figure 2. The use of generalized distribution data greatly simplifies the task of representing washability data in the simulator.

Float-and-sink calculations depend not only on the specific gravity of material in the feed, but also on the size consist. Consequently, a different generalized distribution curve is obtained for each of several size increments of the feed material. To simulate the performance of a washer, then, it is necessary to consider the feed as divided into several size increments, and each size increment as subdivided into specific gravity fractions. The washer's effect on each size and specific gravity fraction is determined, and then the overall clean coal and refuse products are reconstituted. Mathematically, this can be expressed as

$$F_C(\rho_{50}) = \sum_i \sum_j C_{ij}(\rho_{50}) f_{ij} \qquad (1)$$

$$F_R(\rho_{50}) = \sum_i \sum_j [1 - C_{ij}(\rho_{50})]\, f_{ij} \qquad (2)$$

where F_C represents the overall clean coal flowrate, F_R represents the refuse flowrate, f_{ij} represents the flowrate of feed in the ith size fraction

and the jth specific gravity fraction, and $C_{ij}(\rho_{50})$ is the distribution factor for the ith size fraction and jth specific gravity fraction. Note that product flowrates and values for the distribution factor depend upon the value specified for the control parameter, ρ_{50} (that is, the overall specific gravity of separation).

Since the overall specific gravity of separation (for the entire feed composite) will be specified, rather than the specific gravity of separation for each particular size fraction, it will be necessary to determine a value for the specific gravity of separation for each size fraction from the overall specific gravity of separation. This can be accomplished by calculating the ratio of the specific gravities of separation, i.e.

$$r_i = \rho_{i_{50}} / \rho_{50} \tag{3}$$

where $\rho_{i_{50}}$ refers to the specific gravity of separation for the ith size fraction.

A conventional distribution curve for the ith size fraction can be obtained from the corresponding generalized distribution curve by transforming the abscissa from x to ρ, i.e.

$$\rho = \rho_{i_{50}} x \tag{4}$$

combining this result with Equation (3) yields

$$\rho = \rho_{50} r_i x \tag{5}$$

Thus, if the overall specific gravity of separation and the proper value for r_i are known, a conventional distribution curve for the ith size fraction can be constructed and the values for C_{ij} required in Equations (1) and (2) can be determined. The current simulation program contains tabulated

values of both the generalized distribution data and the corresponding r_i factors for each of the following commonly used coal washing units:

1. Baum jig
2. Dense-medium vessel
3. Dense-medium cyclone
4. Hydrocyclone
5. Concentrating table

In each case the basic distribution data were obtained from U.S. Bureau of Mines reports (5-9). Within the computer model a four-point Lagrangian interpolation routine is used in conjunction with the tabular generalized distribution data. The tabular data included in the simulation program are also summarized by Gottfried and Jacobsen (4).

The use of Equations (1) and (2) is straightforward when the size fractions that are used to characterize the feed coincide with the size fractions corresponding to the distribution data. Usually, however, these size fractions will not be the same. This problem can be resolved by transforming the feed from its original size fractions, $\underset{\sim}{S}$, to the size fractions corresponding to the distribution data, $\underset{\sim}{\sigma}$; the separation is then carried out in the $\underset{\sim}{\sigma}$ - space, and the product stream is then transformed back to the $\underset{\sim}{S}$-space.

The method used for carrying out the transformations, based upon simple proportionality, makes use of the following two assumptions:

1. The material is distributed uniformly within each size fraction.
2. The range of sizes corresponding to the distribution data encompasses the range of sizes used to characterize the feed; i.e. $\sigma_0 \geq S_0$, and $\sigma_m \leq S_n$. (Note that $\sigma_0 > \sigma_1 > \sigma_2 > \ldots > \sigma_m$ and $S_0 > S_1 > S_2 > \ldots > S_n$.)

The first assumption is quite reasonable provided the size fractions are small (though the question of "how small" remains unanswered). The second assumption will be valid provided the distribution data span a reasonably large range of sizes.

Twelve different situations can arise when transforming from the $\underset{\sim}{S}$-space to the $\underset{\sim}{\sigma}$-space, as outlined below. The procedure is to select and utilize an appropriate transformation equation for each size fraction in the $\underset{\sim}{\sigma}$-space, i.e. for each $\Delta\sigma_j$ (where $\Delta\sigma_j = \sigma_j - \sigma_{j-1}$, $j = 1, 2, \ldots, m$).

1. $\underline{\sigma_{j-1} \leq S_{i-1} \text{ and } \sigma_j \geq S_i}$,

$$w_j(\underset{\sim}{\sigma}) = w_i(\underset{\sim}{S}) \left[\frac{\sigma_j - \sigma_{j-1}}{S_i - S_{i-1}}\right] \tag{6a}$$

(see Fig. 3a)

2. $\underline{\sigma_{j-1} \leq S_{i-2} \text{ and } \sigma_j \geq S_i}$,

$$w_j(\underset{\sim}{\sigma}) = w_{i-1}(\underset{\sim}{S}) \left[\frac{S_{i-1} - \sigma_{j-1}}{S_{i-1} - S_{i-2}}\right] + w_i(\underset{\sim}{S}) \left[\frac{\sigma_j - S_{i-1}}{S_i - S_{i-1}}\right] \tag{6b}$$

(see Fig. 3b)

3. $\sigma_{j-1} \leq S_{i-k-2}$ and $\sigma_j \geq S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_{i-k-1}\,\underset{\sim}{(S)} \left[\frac{S_{i-k-1} - \sigma_{j-1}}{S_{i-k-1} - S_{i-k-2}}\right] + \sum_{\ell=1}^{k} w_{i-\ell}\,\underset{\sim}{(S)} + w_i\,\underset{\sim}{(S)} \left[\frac{\sigma_j - S_{i-1}}{S_i - S_{i-1}}\right] \qquad (6c)$$

(see Fig. 3c)

4. $\sigma_{j-1} > S_{i-1}$ and $\sigma_j \geq S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_i\,\underset{\sim}{(S)} \left[\frac{\sigma_j - S_{i-1}}{S_i - S_{i-1}}\right] \qquad (6d)$$

(see Fig. 3d)

5. $\sigma_{j-1} > S_{i-2}$ and $\sigma_j \geq S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_{i-1}\,\underset{\sim}{(S)} + w_i\,\underset{\sim}{(S)} \left[\frac{\sigma_j - S_{i-1}}{S_i - S_{i-1}}\right] \qquad (6e)$$

(sse Fig. 3e)

6. $\sigma_{j-1} > S_{i-k-2}$ and $\sigma_j \geq S_i$:

$$w_j(\underset{\sim}{\sigma}) = \sum_{\ell=1}^{k+1} w_{i-\ell}\,\underset{\sim}{(S)} + w_i\,\underset{\sim}{(S)} \left[\frac{\sigma_j - S_{i-1}}{S_i - S_{i-1}}\right] \qquad (6f)$$

(see Fig. 3f)

7. $\sigma_{j-1} \leq S_{i-1}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_i\,\underset{\sim}{(S)} \left[\frac{S_i - \sigma_{j-1}}{S_i - S_{i-1}}\right] \qquad (6g)$$

(see Fig. 3g)

8. $\sigma_{j-1} \leq S_{i-2}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_{i-1}(\underset{\sim}{S})\left[\frac{S_{i-1} - \sigma_{j-1}}{S_{i-1} - S_{i-2}}\right] + w_i(\underset{\sim}{S}) \tag{6h}$$

(see Fig. 3h)

9. $\sigma_{j-1} \leq S_{i-k-2}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_{i-k-1}(\underset{\sim}{S})\left[\frac{S_{i-k-1} - \sigma_{j-1}}{S_{i-k-1} - S_{i-k-2}}\right] + \sum_{\ell=0}^{k} w_{i-\ell}(\underset{\sim}{S}) \tag{6i}$$

(see Fig. 3i)

10. $\sigma_{j-1} > S_{i-1}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_i(\underset{\sim}{S}) \tag{6j}$$

(see Fig. 3j)

11. $\sigma_{j-1} > S_{i-2}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = w_{i-1}(\underset{\sim}{S}) + w_i(\underset{\sim}{S}) \tag{6k}$$

(see Fig. 3k)

12. $\sigma_{j-1} > S_{i-k-2}$ and $\sigma_j < S_i$:

$$w_j(\underset{\sim}{\sigma}) = \sum_{\ell=0}^{k+1} w_{i-\ell}(\underset{\sim}{S}) \tag{6ℓ}$$

(see Fig. 3ℓ)

Once the separation has been carried out in the $\underset{\sim}{\sigma}$-space, then the weight distribution of the products can be transformed back into the $\underset{\sim}{S}$-space

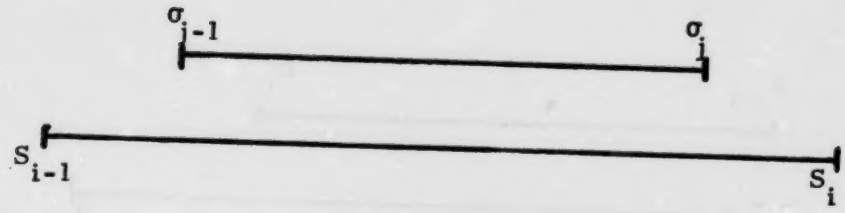


FIGURE 3a

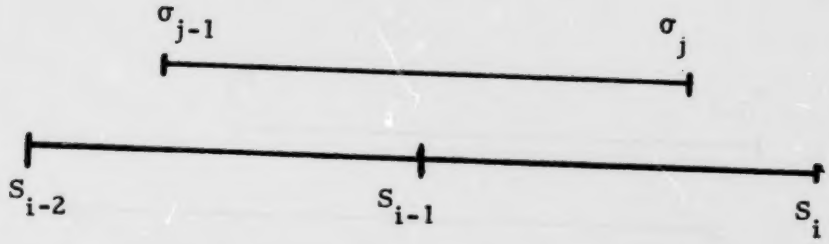


FIGURE 3b

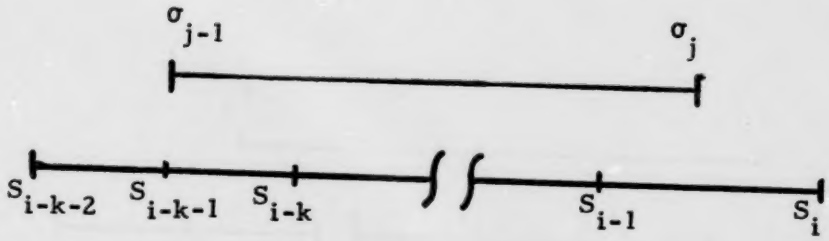


FIGURE 3c

Fig. 3. Size transformations for carrying out washer calculations

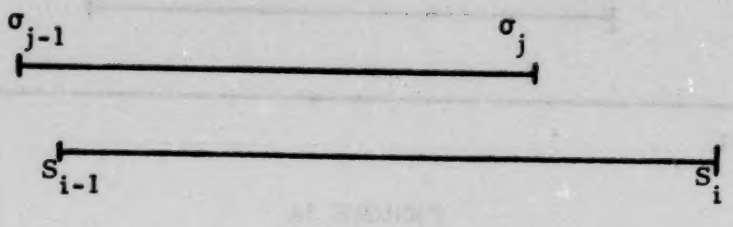


FIGURE 3d

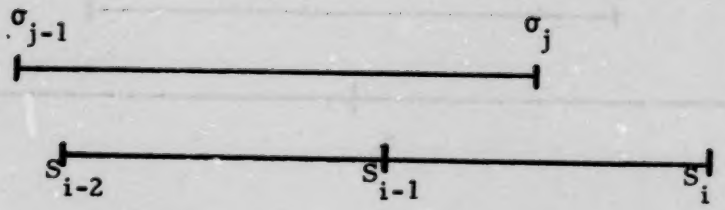


FIGURE 3e

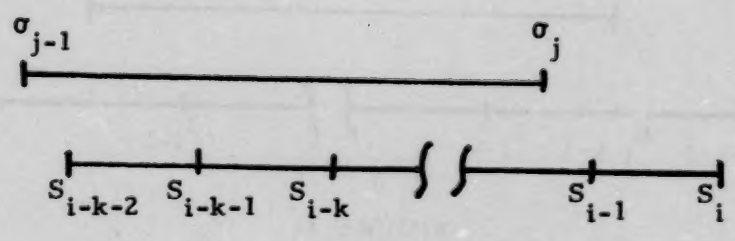


FIGURE 3f

Fig. 3. Size transformations for carrying out washer calculations--(Con.)

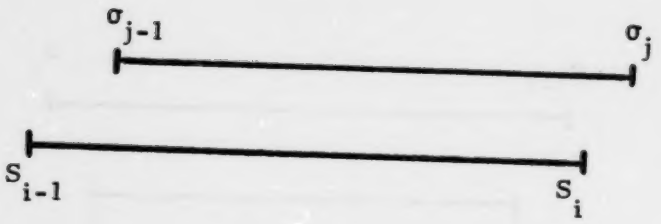


FIGURE 3g

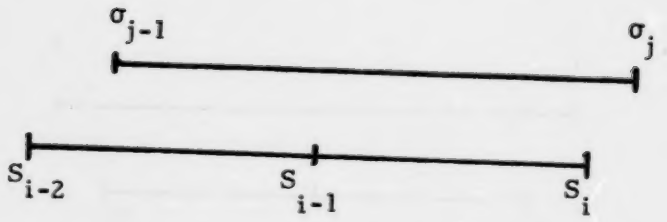


FIGURE 3h

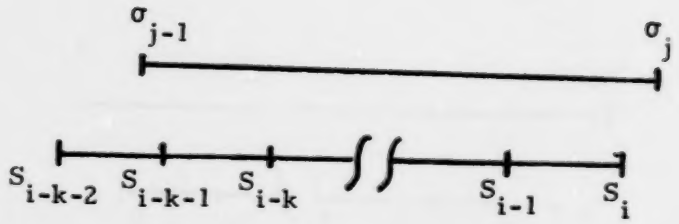
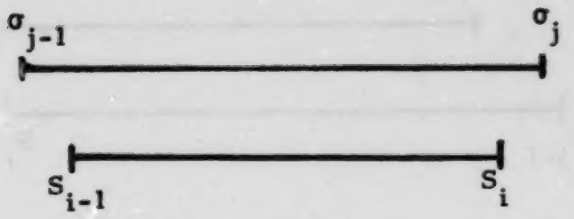


FIGURE 3i

Fig. 3. Size transformations for carrying out washer calculations--(Con.)



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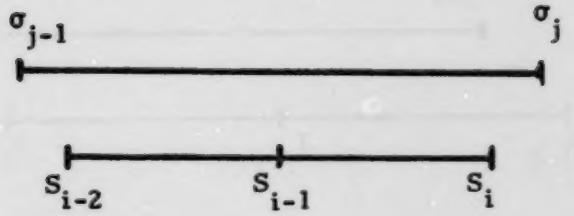

FIGURE 3k

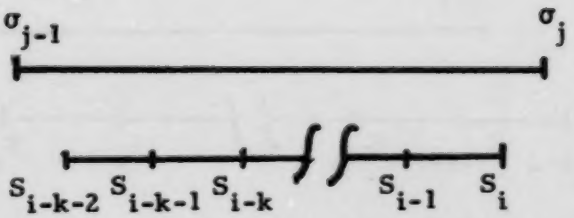

FIGURE 3ℓ

Fig. 3. Size transformations for carrying out washer calculations--(Con.)

by reversing the above procedure. In other words, for each ΔS_i (where $\Delta S_i = S_i - S_{i-1}$, i = 1, 2, ..., n), select an appropriate transformation equation, in accordance with the relationship of the boundaries of ΔS_i with respect to the boundaries of the corresponding $\Delta \sigma$'s.

When carrying out the calculations a set of distribution data is generated from the composite feed and clean coal. A value for ρ_{50}, the overall specific gravity of separation, is then calculated from the distribution data by reverse linear interpolation. This value is compared with the specified value for ρ_{50}. If the two values do not agree to within 0.003, then the value of ρ_{50} that is used to carry out the calculations is adjusted and the entire procedure is repeated. Convergence is normally attained in 3 or 4 iterations.

The overall ash, sulfur, and Btu content of product streams are easily determined once the separation has been carried out. These calculations are based upon the assumption that within each size and specific gravity fraction, the direct (as contrasted with cumulative) values of ash, sulfur, and Btu content are unchanged by cleaning. (In practice this assumption is not strictly true, but it simplifies calculations during this stage of the simulator.

After the separation has been computed a set of summary data is generated for each size fraction, and for the overall composite feed. The following quantities are computed.

1. Screen analysis for each flowstream (i.e. feed, clean coal, refuse and, if applicable, middlings).
2. Percent ash for each flowstream

3. Percent pyritic sulfur for each flowstream
4. Percent total sulfur for each flowstream
5. BTU content of each flowstream
6. Actual recovery, theoretical recovery, recovery efficiency, BTU recovery and ash error
7. Float in refuse, sink in clean coal, total misplaced material and near gravity ±0.1 material
8. Specific gravity of separation, probable error, imperfection and error area
9. Distribution data, determined as the ratio of calculated clean coal to feed

Most of these quantities are obtained by direct summation of the appropriate quantities over the specific gravity fractions. However the theoretical recovery, ash error, specific gravity of separation and probable error are obtained by interpolation, and the error area is obtained by numerical integration (using Simpson's rule). The composite data are obtained by actually summing the computed results over all size fractions and interpolating (where necessary) between the points composited in this manner.

The simulator also contains a provision for the froth flotation process, even though the method used to carry out the computation is less precise than that for the coal washing units listed above. In this case, the overall yield of clean coal is taken as the value of the cumulative weight distribution in the froth flotation feed at a specific gravity of 1.50. Similarly, the overall ash content

of the clean is taken as the cumulative ash of the feed at a specific gravity of 1.60. Detailed specific gravity analyses of the clean coal and refuse products are obtained by applying to the feed a distribution curve that will produce the "1.50-yield/1.60-ash" product. Sulfur and Btu content of the products are obtained from the distribution curve calculations and may differ from the amounts present in either the 1.50 or 1.60 specific gravity feed level.

2.2 Crushers

Crushers are somewhat more difficult to model than washers, because it is necessary to account for both the size distribution of the original (parent) particles and the size distribution of the crushed (daughter) particles. To carry out the calculations, the simulator employs a selection function, $S_i(\beta)$ (the fraction of feed particles in the ith size increment that will be crushed at a given crusher setting β), and a breakage function for crushed particles, $B_{ik}(\beta)$ (the fraction of particles originally in the ith size increment that ends up in the kth size increment). In this model it is assumed that both $S_i(\beta)$ and $B_{ik}(\beta)$ are dependent upon initial particle size but independent of specific gravity. Furthermore, the breakage of a particle is assumed to create fragments that are unchanged in specific gravity analysis.

Flowrate of crushed product in the kth size fraction, $P_k(\beta)$, is expressed as

$$P_k(\beta) = \sum_j \sum_{i<k} f_{ij} S_i(\beta) B_{ik}(\beta) + \sum_j [1 - S_k(\beta)] f_{kj} \qquad (7)$$

where f_{ij} represents the flowrate of feed in the ith size fraction and jth specific

gravity fraction. Note that product flowrates depend upon the value specified for the control parameter, β (i.e., the crusher setting).

The explicit forms of $S_i(\beta)$ and $B_{ik}(\beta)$ depend upon the type of crusher to be simulated and the magnitude of the control parameter. In general, however, these functions are expressed as exponential-type equations. The simulator contains specific equations for each of the following types of crushers:

1. Single roll crusher
2. Multiple roll crusher
3. Gyratory/jaw crusher
4. Cage mill crusher

For each device a distinction is made between a primary and a secondary crusher, the calculations being carried out somewhat differently in each case. (Additional information may be found in Section 7.1)

Once the crusher calculations have been carried out, a set of summary data is generated for each size fraction and for the composite of all size fractions. The summary data are similar to those generated for the washers as described in section 2.1, except that those quantities that apply only to washers are not included (e.g., specific gravity of separation, error area, etc.).

2.3 Screens

The computation of screen performance is similar to the computation of washer performance. A selection function, $S_i(\sigma)$, is again required; the selection function now represents the fraction of feed particles in the ith size increment that passes over the screen into the overflow (coarse) product, given

a screen opening size σ. Flowrate of overflow material F_o, can then be written as

$$F_o(\sigma) = \sum_i S_i(\sigma) \sum_j f_{ij}, \quad (8)$$

and flowrate of underflow (fine) material, F_u, can be expressed as

$$F_u(\sigma) = \sum_i [1 - S_i(\sigma)] \sum_j f_{ij} \quad (9)$$

where f_{ij} again represents the flowrate of feed in the ith size fraction and jth specific gravity fraction. Note that overflow and underflow rates depend upon the value specified for the control parameter, σ (i.e., the screen opening size).

The simulation program includes several exponential-type equations for the selection function; the exact equation depends upon the type of screen selected. Both primary and secondary screens can be simulated, in either a dry or a wet operating mode. (See Section 7.1 for further information.)

Summary data for each size fraction and for the size composite are generated after the screen calculations have been carried out.

2.4 Rotary Breaker

The methods used to simulate crusher and screen performance are combined in the rotary breaker model. Essentially, the rotary breaker is considered to be a sequence of consecutive events where breakage and screening alternate, as feed material undergoes successive falls in a rotating, perforated drum. The model includes its own breakage distribution function, selection-for-breakage function, and screen selection function. A "work-hardening" factor is also included for the case where initial particle flaws are

activated primarily in the first few falls. Thus the selection-for-breakage function decreases with subsequent falls because of its dependence on the work-hardening factor. (See Section 7.1 for additional information.)

The rotary breaker routine requires three input parameters---drum length, drum diameter, and size of openings in the drum (screen size). The height of each fall and the number of falls (required control parameters) are determined from the breaker's physical dimensions.

The predictive calculations for the rotary breaker performance are followed by the customary summary calculations for each size fraction and for the size composite.

2.5 Blender

A "blender" is simply a point within the plant where two different flow streams are combined. The flowrate of blended product can be expressed as

$$P = \sum_i \sum_j (f_{ij1} + f_{ij2}) \tag{10}$$

where P represents the flowrate of the product stream, and f_{ij1} and f_{ij2} represent the flowrates of the first and second feed streams in the ith size fraction and the jth specific gravity fraction. Similarly, any attribute in the blended product can be determined as

$$A = \frac{1}{P} \sum_i \sum_j (A_{ij1} f_{ij1} + A_{ij2} f_{ij2}) \tag{11}$$

where A represents the attribute (e.g. ash, sulfur or BTU content) in the blended stream, and A_{ij1} and A_{ij2} represent the attributes of the first and

second feed streams in the ith size fraction and the jth specific gravity fraction. Notice that the blender calculations do not require the specification of a control parameter.

Summary data for each size fraction and for the size composite are generated at the conclusion of the above calculations.

2.6 Splitter

A "splitter" is a point within the plant where a portion of a flow stream is diverted. The net effect is to create two flow streams from one flow stream, where the combined flowrates of the two new streams equal the flowrate of the original stream. The composition of the new streams will be the same as the original stream. Thus,

$$F_1(\alpha) = \sum_i \sum_j \alpha f_{ij} \tag{12}$$

and

$$F_2(\alpha) = \sum_i \sum_j (1-\alpha) f_{ij} \tag{13}$$

where f_{ij} represents the flowrate of the feed stream in the ith size fraction and the jth specific gravity fraction, F_1 and F_2 represent the product streams, and α is a control parameter, $0 < \alpha < 1$.

After the above calculations have been carried out, a set of summary data are generated for each size fraction and for the size composite.

2.7 Component Interconnection

The simulator allows the output from any unit (i.e., any washer, crusher, screen, breaker, blender or splitter) to be directed to any other unit. Thus any combination of individual units can be interconnected into

whatever unified plant configuration the user wishes to simulate. This is accomplished simply by specifying an origin and a destination for each flowstream within the plant. The manner in which this is carried out is illustrated in the sample problem presented in Section 7.5.

3. USE OF THE SIMULATOR

To use the simulator, the following information must be provided:

1. For each major plant component (unit), appropriate unit settings (control parameters).
2. The origin and destination of each flowstream.
3. A screen analysis of the raw feed.
4. A specific gravity analysis for the overall feed (i. e., the distribution of weight, ash, pyritic sulfur, and total sulfur).
5. Constants for calculating the BTU content of the coal as a function of its ash content.

Numerical values must also be provided for other parameters, such as total number of units, total number of flowstreams, and type of output required.

The output generated by the simulator will always include the following information:

1. A summary of the input data specifying the plant configuration, the control variables and several miscellaneous program parameters.
2. A specific gravity analysis of the feed stream (input data).
3. A table summarizing the yield and BTU recovery of each unit within the plant.
4. A summary table indicating the relative flowrate, composition, BTU content and lbs SO_2/MM BTU for each flowstream in the plant.

In addition, the simulator can generate optional tables giving more detailed information about each unit and each flowstream. Specifically, the simulator can generate

1. A table summarizing the performance of each unit, by feed size fractions and for the entire feed composite.
2. A complete specific gravity analysis for each flowstream.

The unit summary tables can be printed out by themselves, or else the unit summaries can be followed by the specific gravity analyses. The latter option provides the most complete level of output information.

The simulation program has been written in standard FORTRAN IV. It employs a highly modularized structure, requiring 56K of memory for a version that will accommodate a maximum of 30 units and 25 flowstreams. Memory requirements can be further reduced through the use of an overlay structure, but this results in a penalty of longer execution times.

The program typically requires less than one minute of running time on a large computer. For example, a plant configuration consisting of 12 units and 20 flowstreams was simulated on a CDC CYBER-74 computer in 46 seconds (27 seconds required for compilation, 19 seconds for program execution).

A representative set of output data are shown in Section 7.5.

4. CONCLUSIONS AND RECOMMENDATIONS

The simulation program described in this report is a flexible and convenient tool for analyzing the performance of coal preparation plants. When used properly it can assist a decision maker in comparing various coal preparation alternatives, such as

- Different operating conditions for a given plant.
- Different plant configurations.
- Different coal feeds.
- Different environmental restrictions.

A characteristic of all sophisticated computer software is, however, the fact that a program can always be further improved. This program is no exception - additional features can be added which will enhance its value by providing additional information or by further facilitating its use. Specifically, the addition of the following items is recommended.

1. The simulation of additional unit operations, such as thickeners, filters, thermal dryers and other dewatering devices.
2. A more accurate technique for simulating the froth flotation process.
3. A provision for estimating the costs associated with coal preparation, including both capital investment and operating revenues.
4. The effects of flow rate on equipment performance.
5. Improvements in the crushing model to include the change in

flowstream characteristics as a result of particle fragmentation (i. e., a "liberation" model).

7. The effect of beneficiation upon the direct ash, sulfur and BTU content of specific gravity fractions in the products as compared to the feed.

8. Implementation of the simulator on a minicomputer, thus allowing the program to be used in an actual plant environment.

9. Implementation of the simulator in a timesharing mode, thus providing a preparation engineer or a plant manager with an interactive, conversational capability.

10. Expansion of the simulator into a plant optimization program. This would allow one to determine those values of the control parameters that cause the yield of clean coal to be maximized, subject to imposed environmental restrictions.

In addition, the simulator should be validated by comparing the predicted results with actual plant data.

Finally, it should be understood that this simulation program is <u>not</u> intended to be used for detailed engineering design purposes.

5. ACKNOWLEDGMENTS

Several people have made significant contributions to the successful completion of this project. In particular, the efforts of Mr. P. S. Jacobsen,* formerly of the U. S. Bureau of Mines Bruceton, Pa. Coal Preparation Laboratory, have been especially valuable in the design, refinement and assessment of the program. Mssrs. A. W. Deurbrouck and J. Wizzard of the U. S. Bureau of Mines Bruceton Pa. Coal Preparation Laboratory have also been very helpful in support of this activity.

The crushing and screening routines that are used in the program were developed by Dr. A. Vaillant and his associates at Automated Process Surveys, Inc., New York, N. Y. Their contribution is gratefully acknowledged.

Mssrs. Wayne Baughman and Jephthah Abara of the University of Pittsburgh were very helpful in assisting with the program development.

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*Mr. Jacobsen is now with the Colorado School of Mines Research Institute, Golden, Colorado

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7. APPENDIX

Contents:

7.1 Automated process Surveys' final report (crushers, screens, rotary breaker)

7.2 Program structure

7.3 Program listing

7.4 Instructions for data preparation

7.5 A sample problem, including data preparation and computer output

AUTOMATED PROCESS SURVEYS

7.1 APS Final Report

AUTOMATED PROCESS SURVEYS

MODELLING CRUSHERS, BREAKERS AND SCREENS

FOR USE IN

COMPUTER SIMULATION

OF

COAL PREPARATION PLANTS

GRANT GO-155030

PREPARED BY :

A. VAILLANT

PARTNER

AUTOMATED PROCESS SURVEYS

I. AUTHORITY FOR AUTOMATED PROCESS SURVEYS, APS.

This Work has been conducted at the request of :

MR. A. W. DEURBROUCK - USBM

MR. P. S. JACOBSEN - USBM

DR. B. S. GOTTFRIED - UNIV. OF PITTSBURGH

under U. S. BUREAU OF MINES Grant NO. GO-155030 and supported by the U. S. ENVIRONMENTAL PROTECTION AGENCY.

II. OBJECTIVES

1. Supply a Subroutine and Documentation for Crusher, Rotary Breakers, and Screens for Five Typical Coal Preparation Circuits.
2. Design this Subroutine to be similar in Structure to existing Washing Routines... For Incorporation into a "FLOW-CONNECTING" Main Program.

III. CONCLUSIONS

1. Five Typical Washing Circuits have been modelled, and Computer Subroutines, with a Description of how to use these Routines, have been submitted to the University Of Pittsburgh, to the attention of DR. B. S. GOTTFRIED.
2. For better accuracy these Models should be expanded to include :
   a) EFFECT OF FLOW RATE TO A SCREEN AND CRUSHER.
   b) A LIBERATION MODEL FOR FREEING COAL FROM ASH-AND-SULFUR.

IV - COAL WASHING - BREAKERS AND SCREENS

Coal, fed to a Preparation Plant, consists of a Mixture of Materials which were bonded and cemented together when Coal was first formed. During the mining of this Coal, it is broken into a Mixture of lumps that vary in size from 18" down to the size of Dust. A Coal Preparation Plant expends some additional effort to sort out this Mixture of Carbon-Rich and Carbon-Poor Materials, often breaking the lumps into even smaller lumps in order to physically loosen bonds between Carbon-Rich Particles and other, heavier, particles of Rock and Ash.

Coal-Washing consists of three main Processes :

1. Sorting Coal - By Specific Gravity
2. Sorting Coal - By Sizes
3. Breaking Coal

1. SORTING COAL BY SPECIFIC GRAVITY - (PROGRAM BY UNIV. OF PITT.)

To sort Coal, it is floated in a bath of dense liquid. Heavier Particles sink, while the Lighter Coal is skimmed off as Product. Unfortunately, this Sorting Process is imperfect. Some Ash and Rock float along with the good Coal, while some good Coal sinks along with the Heavy Ash.

The U.S.B.M. has performed extensive Tests on this "Float" Equipment[1], in order to determine both how much Coal is misplaced, and how much Heavy Material is misplaced.

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(1) REF.: DEURBROUCK, A W., and HUDY, J., JR. PERFORMANCE CHARACTERISTICS: DENSE MEDIUM CYCLONES, BUMINES R.I. 7673. (SEE REPORTS ON SPECIFIC GRAVITY SORTING BY ONE OR BOTH AUTHORS, 6239, 7154, 7891, 7982.)

1. SORTING COAL BY SPECIFIC GRAVITY (cont'd)

The USBM Data on Dense Media Equipment can be written Symbolically as C(x,g), and is a Distribution Function.... At present it is a Set of Distribution Functions, Ci(g), one for each Size Range, i. The Symbol Ci(g) or C(x,g) represents the "Weight Percent" of Particles (with Size x and Specific Gravity, g) that will float into the clean Coal Stream of a given type Machine.

Feed Data includes a Size Distribution $f(x)$, which represents the "Percent" of Feed with Size x, and includes a Sink-Float Test, w(x,g). Sink-Float Data, w(x,g) is determined in a Lab for each Size x. For a Group of Particles of Size x, w(x,g) represents the "Weight Percent" that has Specific Gravity, g. For an arbitrarily Fine Feed, the amount of Feed Material, $\bar{F}(x,g)$, having Size x and Specific Gravity, g, is obtained by simply multiplying the Uncoupled Screen Data $f(x)$, and the Sink-Float Data w(x,g), so that :

$$\bar{F}(x,g) = f(x) \cdot w(x,g) \qquad (1)$$

The Independent (Uncoupled) USBM Data, C(x,g), on the Dense Media Machinery, enables you to calculate the amount $\bar{P}(x,g)$, of Material with Size x and Specific Gravity g, that will become the Clean-Coal Product, by a simple, straight-forward Multiplication,

$$\bar{P}(x,g) = C(x,g) \cdot f(x) \cdot w(x,g) \qquad (2)$$

All three terms on the right-hand side of this EQUATION are Data supplied by the U.S.B.M.

The Heavy Refuse is obtained from 1-C(x,g), again by simple Multiplication, EQ.(3) :

$$\text{REFUSE}\ (x,g) = \left[1-C(x,g)\right] \cdot f(x) \cdot w(x,g) \qquad (3)$$

IV-2. - SORTING COAL BY SIZES (PROGRAM BY APS)

Vibrating Screens are used in sorting Coal by Sizes. A typical application of Screens is shown in FIGURE 1, below. For 400 TPH Coal, a Screen with one-inch holes, would actually be Four Machines, each 6 Feet Wide by 16 Feet Long.

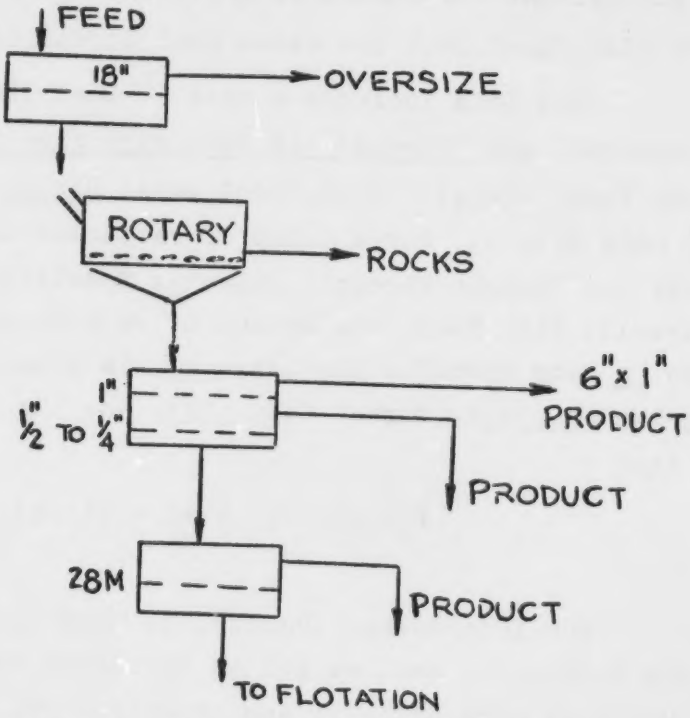


FIG. 4 - SCREENS IN COAL PREPARATION

In such an application, Manufacturers of Screens would estimate that the Screen Efficiency is 92%. This is an overall Figure, which means that 92% of all Material finer than the Opening Size, yo, would pass through the Screen Openings. Manufacturers, however, cannot tell what percent of a given size Particle will pass through the Screen Openings. Dr. Vaillant of Automated Process Surveys, has conducted Research on most types of Screens manufactured in U.S.A., and on some German and Japanese Screens.

IV-2 - SORTING COAL BY SIZES (cont'd)

In order to understand the Test Results, consider Particles on a Screen, FIGURE 2 :

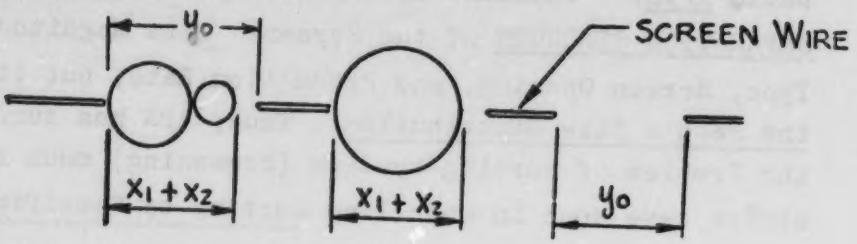


FIG. 5 - SCHEMATIC REPRESENTATION OF PARTICLES ON A SCREEN

Let Two Particles attempt to pass through an Opening of Size yo, and let us assume that the probability of two Particles (Size x_1 and x_2) passing through an opening, is the same as the probability of a Single Particle (of Size x_1 PLUS x_2) passing through the Opening; and assume also the event of Particle with Size x_1 passing is independent of Particle with Size x_2 passing (so that the Conditional Probability relating these events is Unity) then we write this Assumption as :

$$P(x_1) \cdot P(x_2) = P(x_1 + x_2) \qquad (4)$$

This Functional Equation can be solved for P(x):

$P(x) = e^{Rx}$ which you can easily verify by substituting $\exp(Rx_1)$ and $\exp(Rx_2)$ into EQUATION (4).

APS' Tests on Screens show that the Fraction $C_s(x)$, of Feed Particles of Size x, that goes over the Screen into the Coarse Stream is indeed exponential in character over a wide range of x; furthermore, C_s can be written as a Function of $\frac{x}{yo}$,

$$C_s(x) = e^{A(1-x/yo)} \qquad (5)$$

where A is an Experimental Constant, and yo is the Projected Screen Opening.

IV-2 - SORTING COAL BY SIZES (PROGRAM BY APS) (cont'd)

Note that the Selectivity Function, $C_s(x)$, depends on the Ratio x/yo. Vaillant calls the Experimental Constant, "A" the SEPARATION STRENGTH of the Screen. Its Magnitude depends on Screen Type, Screen Opening, and Production Rate, but it is Independent of the Feed's Size Distribution. Thus, APS has succeeded in uncoupling the Problem of Sorting-by-Size (Screening) much in the same way as others have done in modelling Sorting by Specific Gravity.

The Separation Strength depends also on the Location of the Screen Deck within the Machine. Note in FIGURE 1 that the Screen following the Rotary Breaker consists of an Upper Deck, with one-inch Openings, and a Lower Deck with 1/2 inch Openings. Experience shows that a Single Deck Machine with 1/2" Screen-Openings has a higher Separation Strength than does a similar 1/2" Screen Deck that is placed below another Deck. Furthermore, Separation Strength, "A", is improved by operating wet. Some reasonable Values of "A" have been inserted into the Screen Simulation Program supplied by APS.

Screen effectiveness, $C_s(x)$, is ONE MINUS the Efficiency of the Screen for Particle Size x. The Coarse Product Stream, $\bar{P}(x,g)$, from a Screen, can be obtained from this Fundamental Screen Model by a Simple Multiplication, EQUATION (2a) :

$$\bar{P}(x,g) = C_s(x) \cdot f(x) \cdot w(x,g) \qquad (2a)$$

where $f(x)$ is the Feed Size Distribution to the Screen.

Two of the Three Terms on the Right-Hand Side of this Equation (Feed Size Distribution and Sink-Float Data) were supplied as Data by the U.S.B.M.; the Selectivity Function, $C_s(x)$ was supplied by APS.

IV - 3 - BREAKING COAL (PROGRAM BY APS)

Breakers and Crushers are used in Coal Washing and Mineral Beneficiation Plants, and Aggregate Plants where Control of Porosity in "Packings" of Particles is important.

Although Crusher Curves have been available since the 1930's, all this information suffers from one draw-back .... "No information on HOW the Crusher's Feed Size Distribution affects its Product Size Distribution."

APS has undertaken the ambitious task of applying Data on Single Particle Breakage, and on Screen Selectivity in order to match Data on several Types of Commercial Crushers... Our Objective is to build a Mathematical Model of a Crusher, that will include such important variables as :

A. FEED SIZE DISTRIBUTION
B. CRUSHER SETTING
C. THROUGH-PUT RATE
D. LIBERATION OF ASH

Items "C" and "D" are left for future work in another Phase of this Project.

Some Simple Breakage Concepts and Definitions are needed, in order to understand APS's Method of Attack.

IV - 3 - BREAKING COAL (cont'd)

As described in the Literature [1], let B(x,y) represent the Cumulative Size Distribution of a Group of Daughter Particles made by Breaking a Particle, initially of Size y. For example, Coal dropped onto a Pile has been found to break into a Size Distribution given by :

$$B(x,y) = \frac{1 - e^{-x/y}}{1 - e^{-1}} \qquad (6)$$

Notice that the Resultant Distribution depends on x/y. This Function has been found to describe many Breakage Events in Machinery, including Ball Mills and Hammer Mills.

To distinguish between types of Equipment, previous Workers have assumed that each type of Equipment has a Characteristic Way of Selecting Particles for Breakage. This Selection Function, S(y), is the Fraction of Feed Particles of Size y, that would be broken; 1-S(y) would not be broken. A Product, P(x) would be created by adding the Contribution of Daughter Particles of Size x formed from all Larger Particles that have been selected for Breakage.

$$\bar{P}(x,g) = \sum_{y \geq x} S(y)\, \bar{B}(x,y)\, f(y,g) \qquad (7)$$

where $\bar{B}$ is an Increment for a given size Interval surrounding x. Note that F(y,g) = amount of feed having size y and specific gravity g (see $\bar{F}(x,g)$ defined on p. 33).

(1) BROADBENT AND CALCOTT: J. INST. FUEL, 29 (1956) 524-539

IV - 3A - BREAKING FUNCTION OF "CRUSH"

In modelling Crushers, however, APS has found it more practical to alter the Breakage Function, B(x,y), while fixing the Selection Function S(x). Breakage functions for :

GYRATORY CRUSHERS
DOUBLE ROLL CRUSHERS
SINGLE ROLL CRUSHERS
CAGE MILLS
ROTARY BREAKERS

are given in Subroutine "CRUSH", and "ROTARY".

In real Crushers, Particles pass through an Opening, as in a Screen, except that in Crushers the Particles can orient themselves more easily. This ability, for Particle-Orientation, enables a Crusher to discharge Particles larger than the Setting, So.

The "Crushing Process" is different for :

a) PARTICLES SMALLER THAN THE SETTING, So
b) PARTICLES LARGER THAN 1.7 TIMES THE SETTING, So, and
c) PARTICLES WITH A SIZE BETWEEN So and 1.7 So.

The Breakage Functions for each Type of Crusher (given by APS in Subroutine "CRUSH") are used mainly for Particles in Size Range (b), viz... Particles Larger than 1.7 So. For Particles of Size 1.7 So and Smaller, SubRoutine "CRUSH" uses the Natural Breakage Function, defined by EQUATION (6).

IV - 3B - SELECTION FUNCTION OF "CRUSH"

Particles that are slightly smaller than the Crusher's Setting, So, may pass unbroken, depending on how much smaller they are. The chance that a Particle of Size "y" will slip through, without breaking, depends on the Ratio y/So. Since this Process of slipping through a Crusher is conceptually similar to Particles slipping through a Screen, I have assumed Crusher Selectivity S(x) is of the Form given by EQUATION (5) with So replacing yo.

A Primary Crusher has a larger chance of letting Particles slip through unbroken. In Subroutine Crush, "I PRIM" is used to choose the Selection Function for Breakage, which distinguishes Primary Crushers from Secondary Crushers.

IV - 3C - ROTARY (DRUM) BREAKER

The Models of Screening and of Crushing are combined into a Model of the Rotary Breaker (Bradford). The Rotary Breaker is modelled as a Sequence of Consecutive Events where Breakage and Screening alternate.

In addition to having its own Breakage Function, its own Selection-for-Breakage Function, and its own Screen Function, Subroutine "Rotary" includes Physical Variables such as length and diameter of the drum, size of openings in the Rotating Drum (Hole), and

IV - 3C - ROTARY (DRUM) BREAKER (cont'd)

a Work-hardening Function (CFALL). Rocks have their own Work-Hardening Function (RFALL).

The Work-Hardening Function is designed to consider that Initial Flaws are activated upon the first few Falls, but the Daughter Fragments are then stronger, since they may have proportionately fewer Flaws. This is allowed for in Sub-Routine "Rotary", by using a decreasing Selection-For-Breakage Function (CFALL), for each subsequent Fall (or Group of Falls).

An increasing Function, however, could be inserted for "CFALL", if Field Data were to show that a Particular Coal is weakened by successive Falls. Normally, Brittle Materials strengthen as they "age".

Furthermore, the Selection-For-Breakage Function is constructed so that it is also a Function of Particle Size, since some small Particles have only a small tendency to break. Until more Data is available on a Rotary's Product, the Function that accounts for Particle Size (C SELCT) is set uniformly to Unity for all Particles.

In APS's Model, Feed Particles that are much larger than the Crusher Setting (or "Hole" in Subroutine Rotary) will automatically undergo more Breakage Events and so will give a Finer Product than will be given by Feed that is only Slightly larger than the Crusher's Setting.

IV-3D - LIBERATION

APS has found much evidence that Specific Gravity is tied to Ash Content, but is not tied to Particle Size. This appears true, especially for Large Particles, handled in a Coal Washing Operation. For many Coals, only the Finest Sizes seem to deviate from this Principle. Although this observation is of only slight importance in both Screening and Dense Media Separations, it is Critical in Modelling Breakage Processes. Consequently, APS has assumed that Particles, with a given Specific Gravity, break into Daughter-Fragments that have the same Specific Gravity as their Parent's (except for the smallest Fragments, since these are broken no further).

This Technique assures a MASS BALANCE, without needing to identify the Parent of each Particle after Successive Breakage Events. It accounts for the Feed's Initial Differences in Ash vs. Size.

Since we assume every Fragment of a Broken Particle has the same "Chemistry", however, it is clear that this Model does not account for "Liberation"... where Fragments of a Broken Particle differ in Chemistry.

A Liberation Model would be needed in order to account for the effect that Screen-Opening-Size and Crusher-Settings would have on liberating Coal so as to improve Product Quality. Unfortunately, without a Liberation Model, the present Program "COMPUTER SIMULATION OF COAL PREPARATION PLANTS", accounts for Crusher Settings and Screens only as a Secondary Effect, introduced by the small influence that Particle Size has on the Efficiency of Dense Media Separators.

It is left for "FUTURE" Work to devise a better Model with True Liberation.

END.

V - SUBROUTINE NOMENCLATURE

V-1 - SUBROUTINE "CRUSH"

(EACH SUBROUTINE INCLUDES A PRINTED SET OF NOMENCLATURE)

L REPRESENTS EQUIPMENT NUMBER

So REPRESENTS CRUSHER SETTING

SIZE (I) REPRESENTS INCREMENTS IN SIZE

I = 1 IS FOR TOP SIZE AND LARGER

I = 2 IS FOR NEXT SMALLER SIZE

⋮

I = N SIZE + 1 → LAST VALUE. (I = 1, TO N SIZE + 1)

FEED (I,J,1)•FEED (I,J,2) = WEIGHT OF ASH IN THE INTERVAL I,J

FEED (I,J,1)•FEED (I,J,3) = " " PYRITIC SULFUR " " " "

FEED (I,J,1)•FEED (I,J,4) = " " TOTAL SULFUR " " " "

PROD (I,J,K) REPRESENTS PRODUCT STREAM'S NORMALIZED OUTPUT

V-1A DATA

S RATIO y/So

SP SELECTION-FOR-BREAKAGE FUNCTION ... PRIMARY CRUSHER

SS SELECTION-FOR-BREAKAGE FUNCTION ... SECONDARY CRUSHER

B RATIO x = PRODUCT SIZE
y = FEED SIZE

V-2 - SUBROUTINE "SCREEN"

ScSz ..... SCREEN OPENING, INCHES

FEED ..... FEED TO THIS EQUIPMENT (NEED NOT BE NORMALIZE

Sover ..... OVERS ... NORMALIZED

Sunder ..... UNDER ... NORMALIZED

Fover ..... IF FEED IS NORMALIZED Fover + Funder = 1.0

IF FEED IS NOT NORMALIZED Fover + Funder = $\sum_i$ FEED (i,1)

V - SUBROUTINE NOMENCLATURE (cont'd)

V-2A DATA

SSZ	OPENING AT WHICH DATA IS GIVEN FOR "A"
D_1	"A" VALUES UPPER DRY
D_2	"A" VALUES LOWER DRY
D_3	"A" VALUES UPPER WET
D_4	"A" VALUES LOWER WET

V-3 - SUBROUTINE ROTARY

HGT	.....	HEIGHT OF DROP (STANDARD HEIGHT IS 6 FT.
HOLE	.....	6" OR 8" DATA
NFALL	....	NUMBER OF FALLS IN MACHINE
TFEED	.....	ROCK + COAL .... NORMALIZED
CPROD	.....	UNDERS ..... COAL PRODUCT STREAM
RPROD	.....	OVERS ..... ROCK
FC PROD	...	FRACTION OF UNITY, COAL .... FIGURE 4
FR PROD	...	FRACTION OF UNITY, ROCKS ... FIGURE 4

V-3A DATA

CFALL .. COAL FALL : POR FIRST DROP ;

$S_c(x) = (\text{CFALL} = .20) \cdot (\text{C SELCT})$

RFALL .. ROCK FALL : FOR FIRST DROP ;

$S_r(x) = (\text{RFALL} = .005) \cdot (\text{R SELCT})$

B USES NATURAL BREAKAGE FUNCTION

$$\text{BRATIO} = \frac{\text{PROD SIZE}}{\text{FEED SIZE}}$$ AS IN "CRUSH"

V - SUBROUTINE NOMENCLATURE (cont'd)

SPLITTING A FEED STREAM

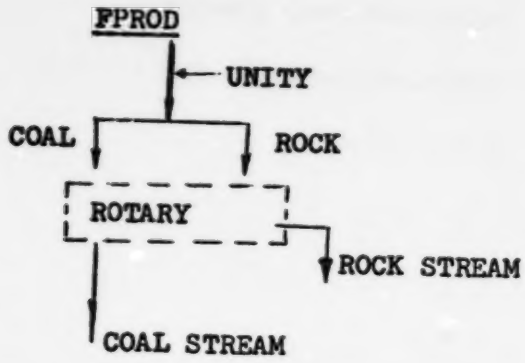


FIG. 6 - IDENTIFICATION OF STREAMS

PICTORIAL MODEL OF ROTARY BREAKER CALCULATIONS

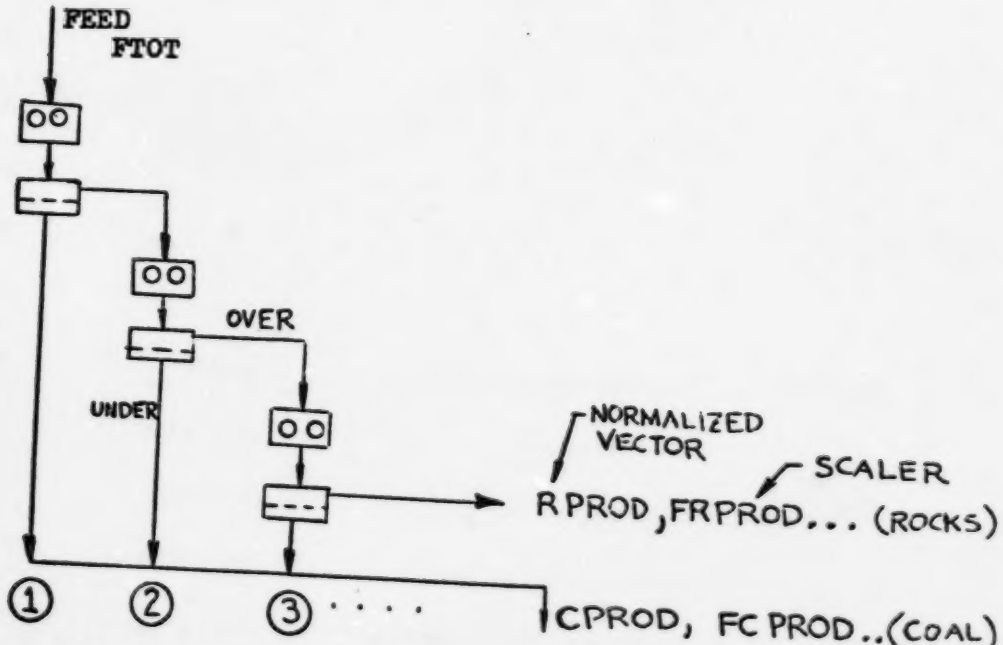


FIG. 7 - MODEL OF ROTARY BREAKER

7.2 Program Structure

7.2.1 Subprograms

Subprogram	Purpose	Referenced By	References
MAIN	Executive routine. Reads input, references major computational and output subprograms		BLEND CONVRT CRUSH EXPAND FROTH OUTPT1 OUTPT2 OUTPT3 OUTPT4 REDUCE ROTARY SCREEN SEP SPLIT VESSEL
BLEND	Blends two distinct flowstreams.	MAIN ROTARY	SDSIZE
BTUPLB	Calculates the BTU content of coal as function of ash content	OUTPT1 OUTPT3 OUTPT4 ROTARY SDSIZE	

CONVRT	Converts numerical symbols (characters) to actual numbers.	MAIN	
CRUSH	Simulates crusher performance.	MAIN	INTS SDSIZE
EXPAND	Converts a 1-dimensional array to a 3-dimensional array.	MAIN OUTPT4	
FROTH	Simulates froth flotation performance.	MAIN	SDSIZE Y YINTRP
INTS	Linear interpolation.	CRUSH ROTARY SCREEN	
OUTPT1	Prints specific gravity analysis of a specified flowstream.	MAIN	BTUPLB
OUTPT2	Prints summary data for a specified unit.	MAIN	
OUTPT3	Calculates and prints overall attributes for a specified flowstream.	MAIN	BTUPLB

OUTPT4	Calculates and prints overall summary data all units and all flowstreams.	MAIN	BTUPLB EXPAND VESSEL
REDUCE	Converts a 3-dimensional array to a 1-dimensional array.	MAIN	
ROTARY	Simulates rotary breaker performance.	MAIN	BLEND BTUPLB INTS
SCREEN	Simulates screen performance.	MAIN	INTS SDSIZE
SDSIZE	Calculates composition of a specified flowstream by size increments.	BLEND CRUSH FROTH SCREEN SEP SPLIT	BTUPLB
SEP	Simulates float-sink washer performance.	MAIN YINTRP	SDSIZE Y
SPLIT	Splits a flowstream into two distinct flowstreams.	MAIN	SDSIZE

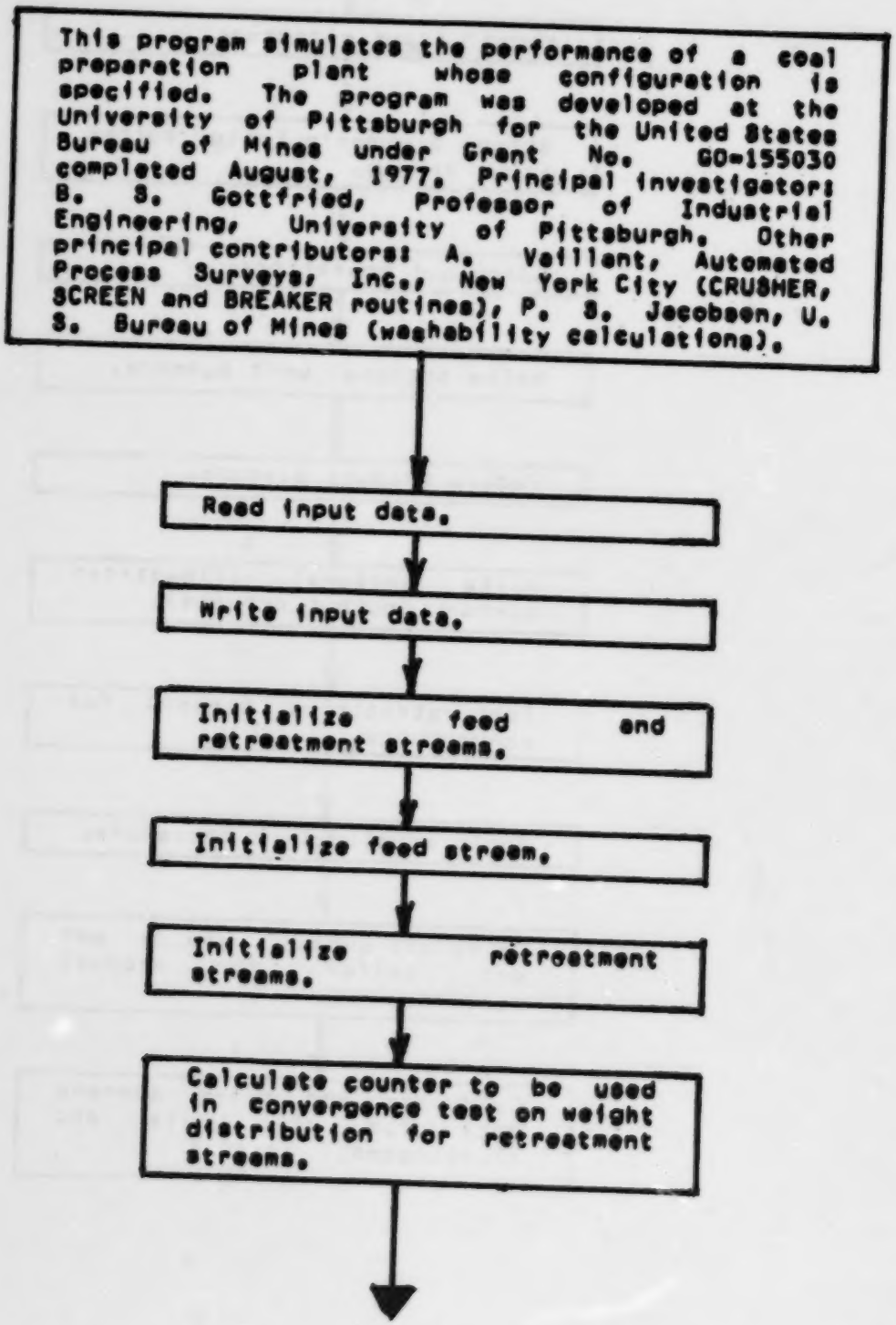
VESSEL	Prints the name of each unit.	MAIN OUTPT4	
Y	Contains generalized distribution data for washers.	FROTH SEP	YINTRP
YINTRP	Lagrangian interpolation.	FROTH SEP YINTRP	

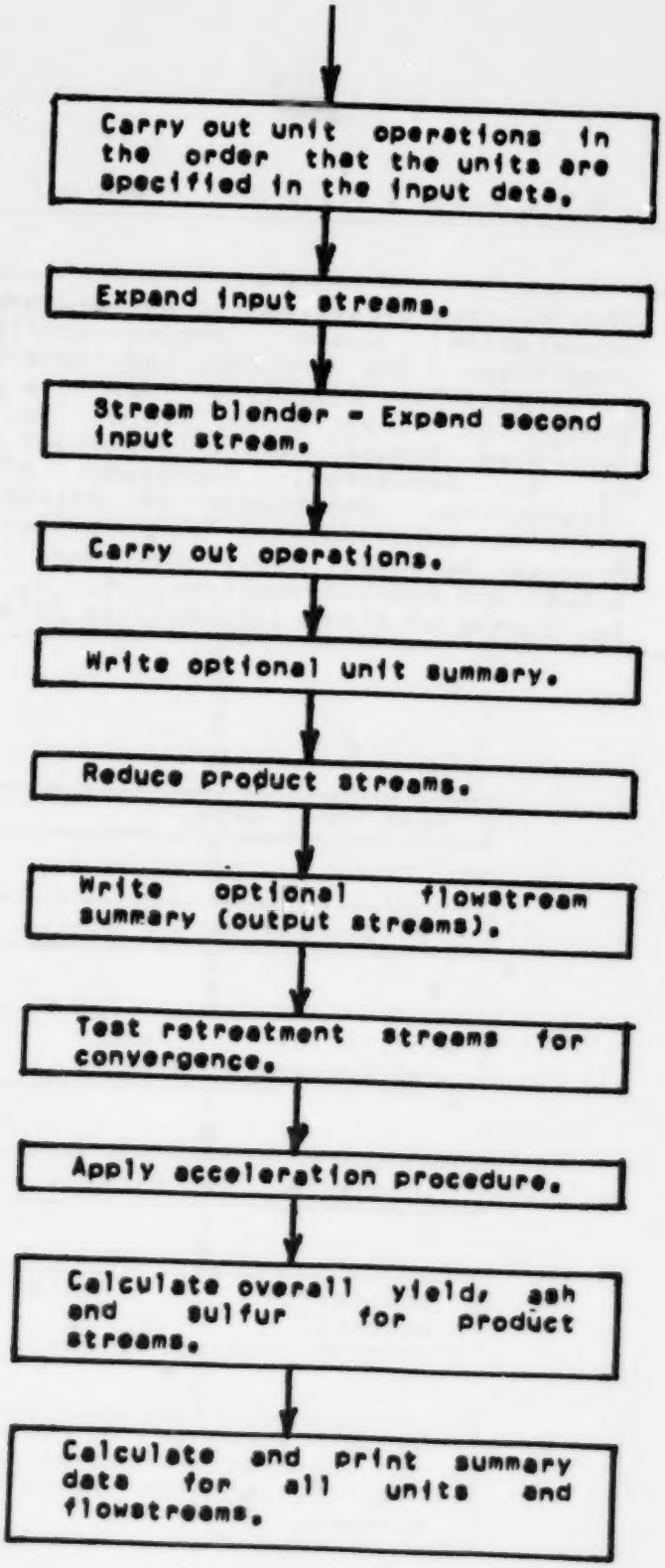
7.2.2 Subprogram Summary

A summary of each program module is presented below. An overall flowchart is shown for each of the more complicated program modules. Highly detailed, computer-generated flowcharts have also been prepared, although they are not included in this report. A copy of the computer-generated flowcharts is on file at the University of Pittsburgh.

MAIN

COAL PREPARATION PLANT SIMULATOR




Carry out unit operations in the order that the units are specified in the input data.
Expand input streams.
Stream blender - Expand second input stream.
Carry out operations.
Write optional unit summary.
Reduce product streams.
Write optional flowstream summary (output streams).
Test retreatment streams for convergence.
Apply acceleration procedure.
Calculate overall yield, ash and sulfur for product streams.
Calculate and print summary data for all units and flowstreams.

FUNCTION BTUPLB

This function calculates the BTU content of a pound of coal as a linear or quadratic function of ash content.

SUBROUTINE BLEND

This subroutine combines two distinct flow streams. Both incoming flow streams must be expressed in terms of the same size increments.

↓

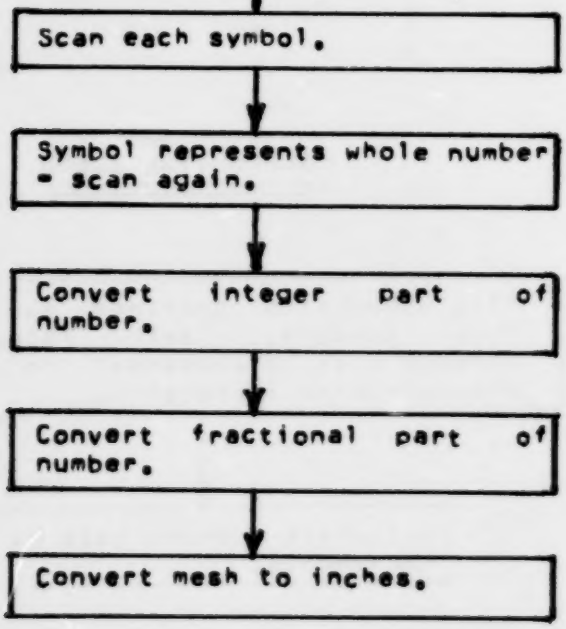
Calculate summary data by size increments.

SUBROUTINE CONVRT

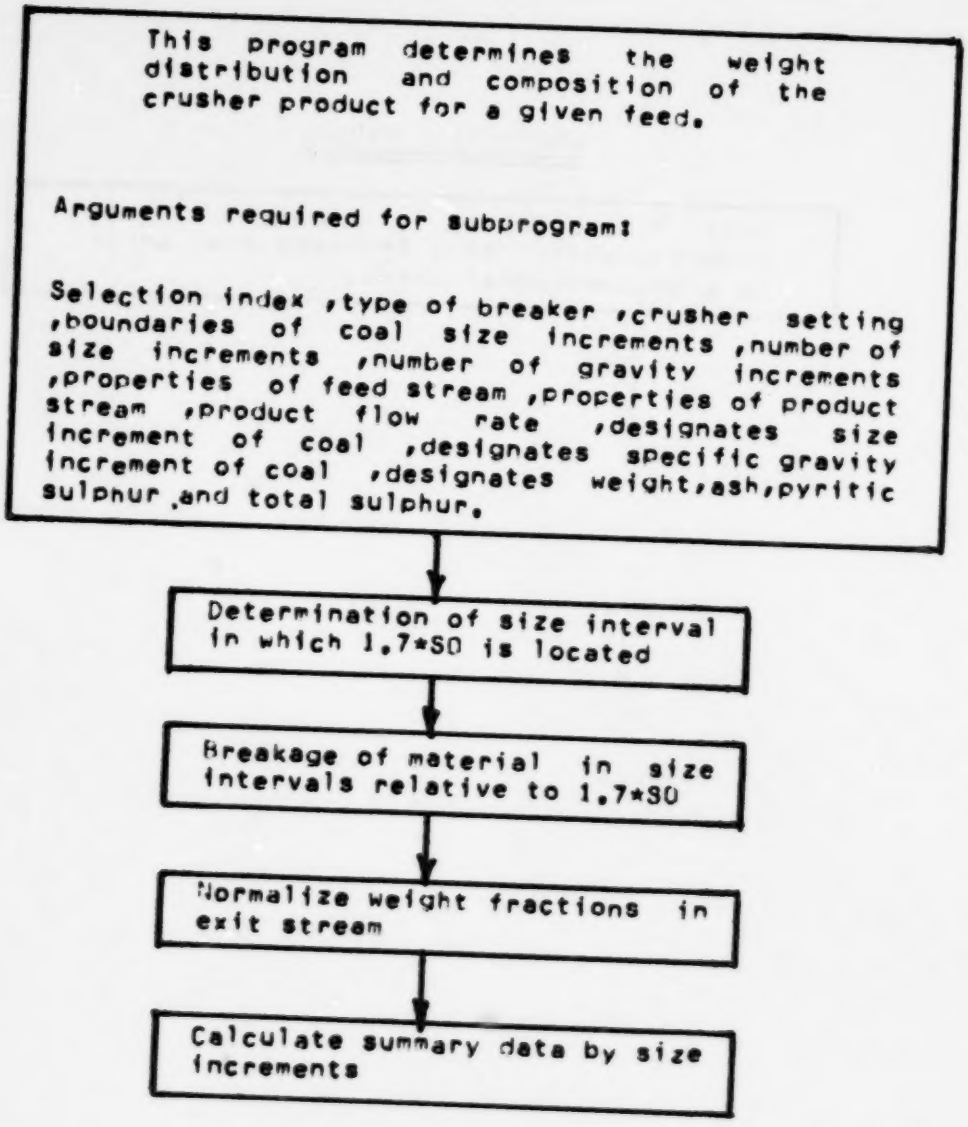
This subroutine converts numerical symbols to numerical quantities

Arguments required for this routine :

Set of numerical symbols ,set of numerical quantities ,mesh size conversions ,whole number units position ,position of numerator in fraction ,position of denominator in fraction.



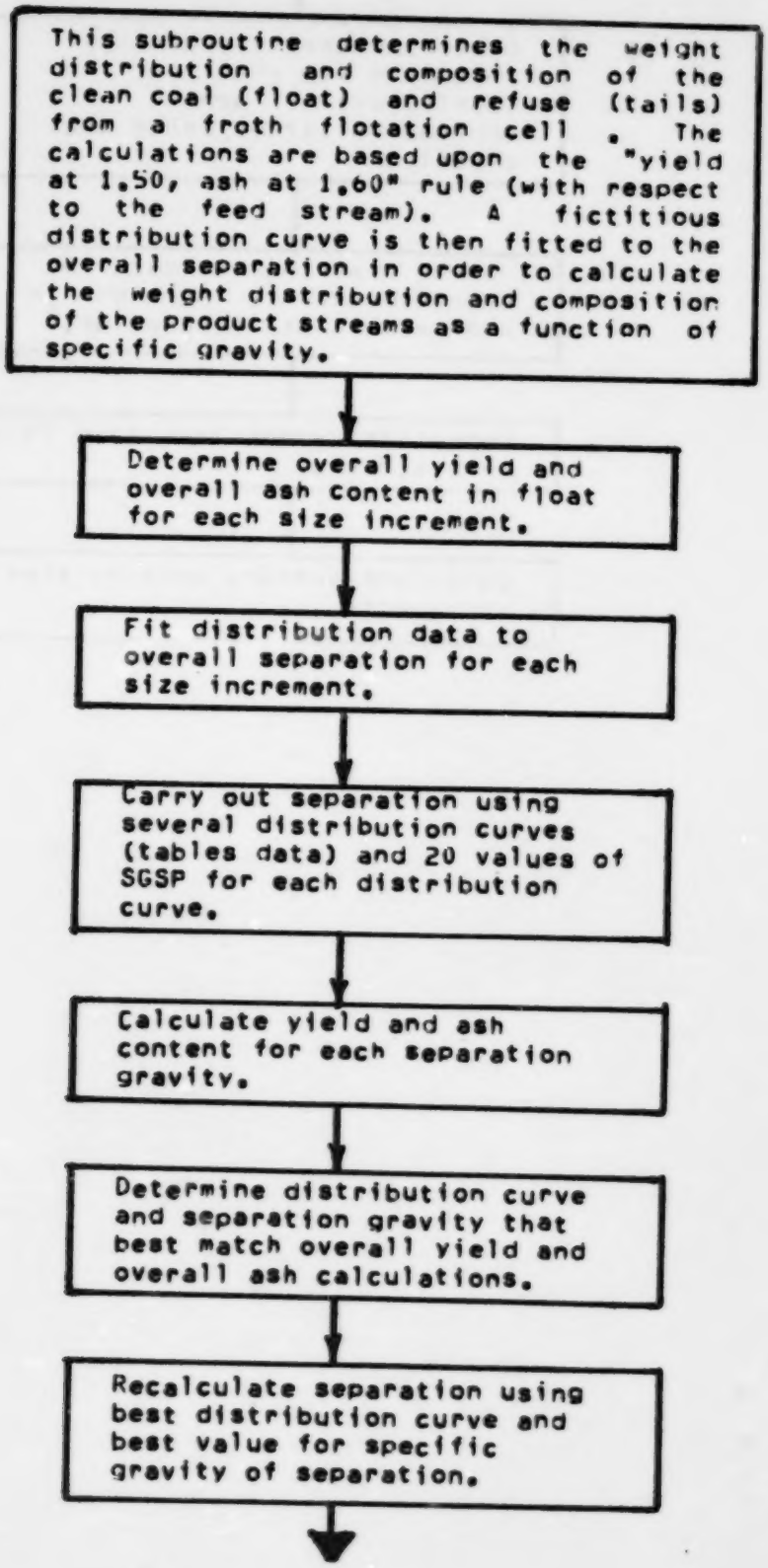
SUBROUTINE CRUSH

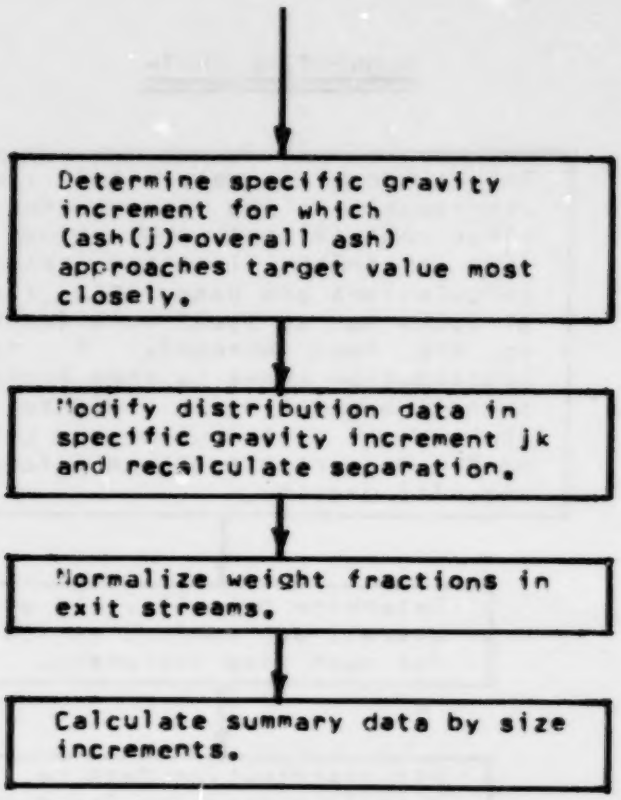


SUBROUTINE EXPAND

This subroutine expands the dimensionality of a 1-dimensional array to a 3-dimensional array.

SUBROUTINE FROTH

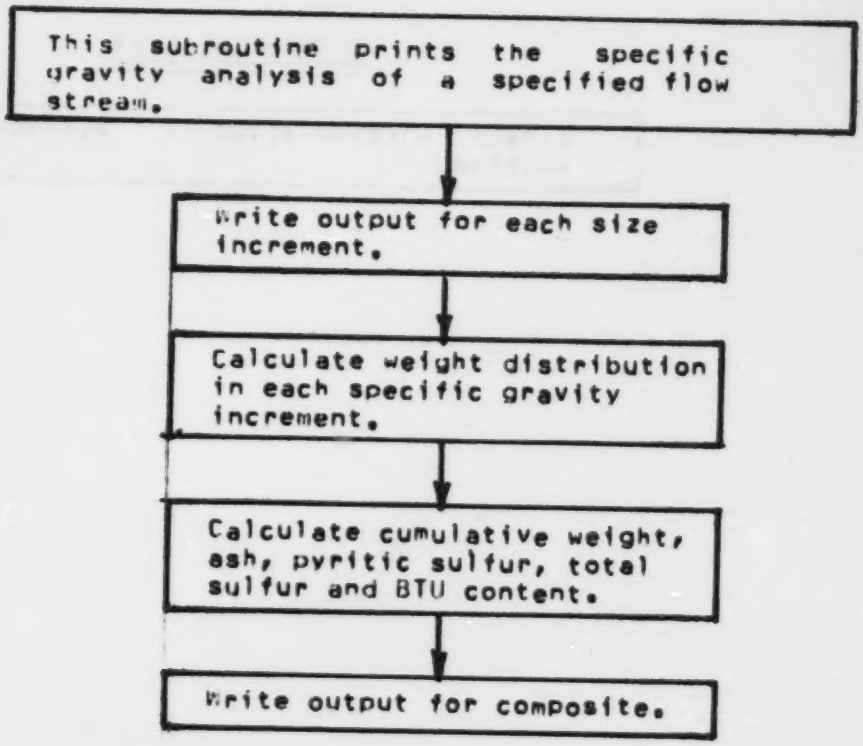



Determine specific gravity increment for which (ash(j)-overall ash) approaches target value most closely.
Modify distribution data in specific gravity increment jk and recalculate separation.
Normalize weight fractions in exit streams.
Calculate summary data by size increments.

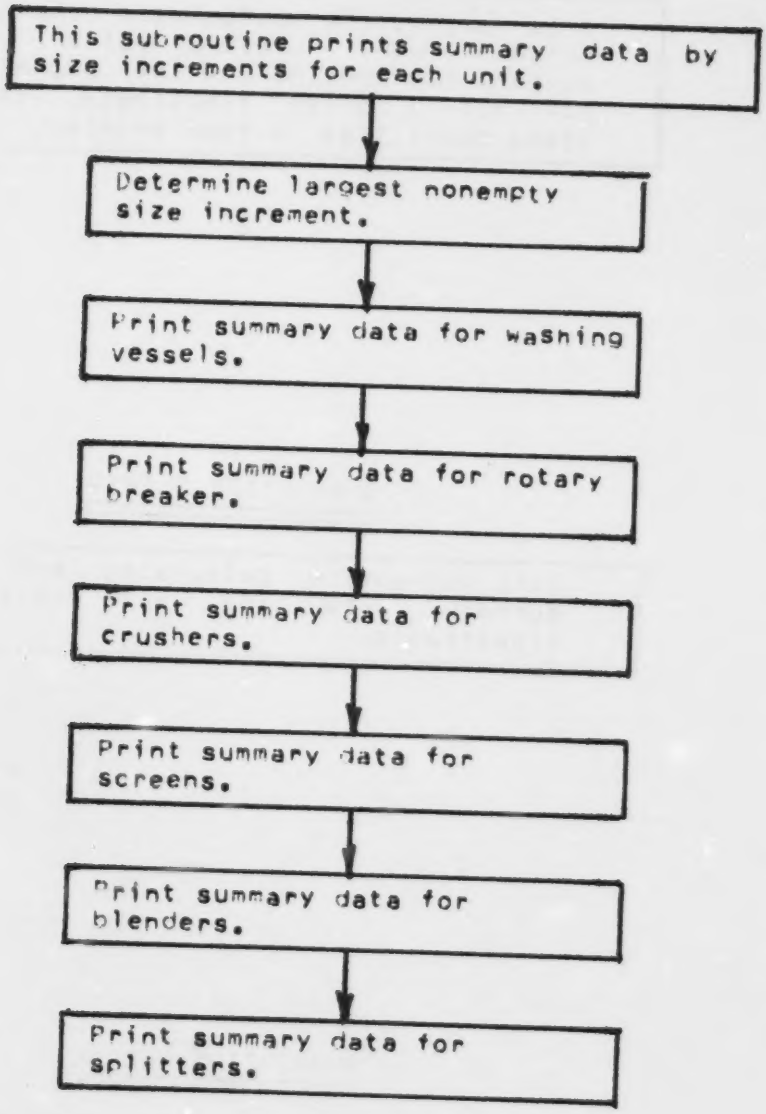
SUBROUTINE INTS

Linear interpolation / extrapolation routine

SUBROUTINE OUTPT1



SUBROUTINE OUTPT2



SUBROUTINE OUTPT3

This subroutine calculates the mean percent ash, pyritic sulfur, total sulfur, BTU content and lbs SO2/million BTU for a given flowstream. Each of these quantities is then printed.

SUBROUTINE OUTPT4

This subroutine calculates and prints summary data for all units and flowstreams.

SUBROUTINE REDUCE

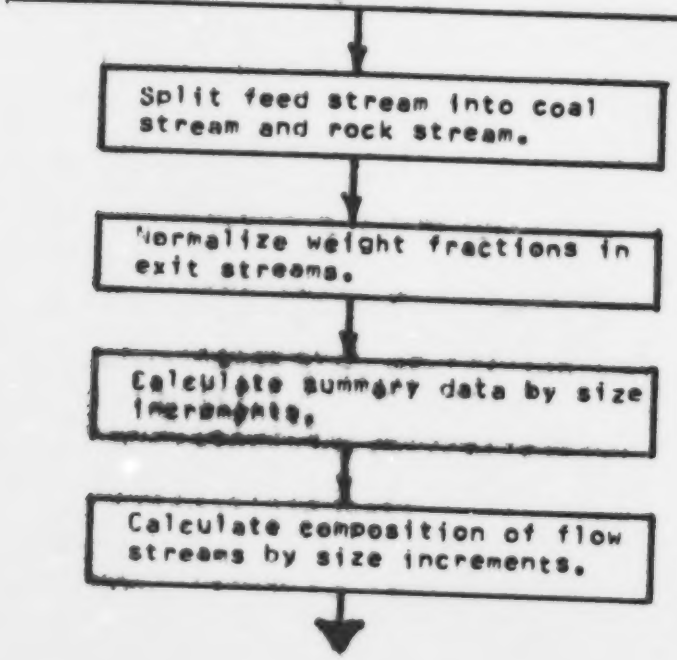
This subroutine reduces the dimensionality of a 3-dimensional array to a 1-dimensional array.

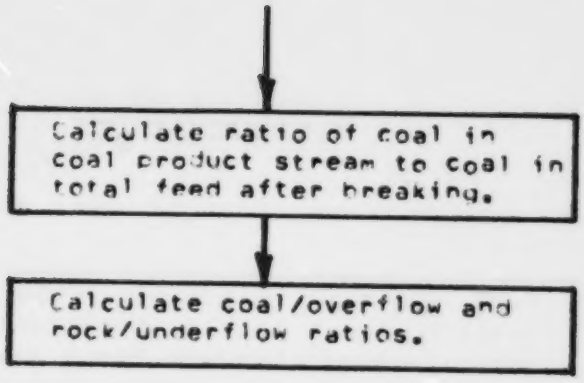
SUBROUTINE ROTARY

This program determines the weight distribution and composition of the rotary breaker product for a given feed.

Arguments required for subroutine:

Breaker length , breaker diameter , height from which material is dropped , opening size , number of times material is dropped , boundaries of coal size increments , number of size increments , number of gravity increments , coal feed flow rate , rock feed flow rate , total feed stream flow rate , coal flow rate in coal stream , rock flow rate in coal stream , rock flow rate in rock stream , coal flow rate in rock stream , coal product flow rate , rock product flow rate , percent of coal feed of size i reporting to product stream , percent of refuse stream of size i composed of coal , percent of product stream of size i composed of rock.



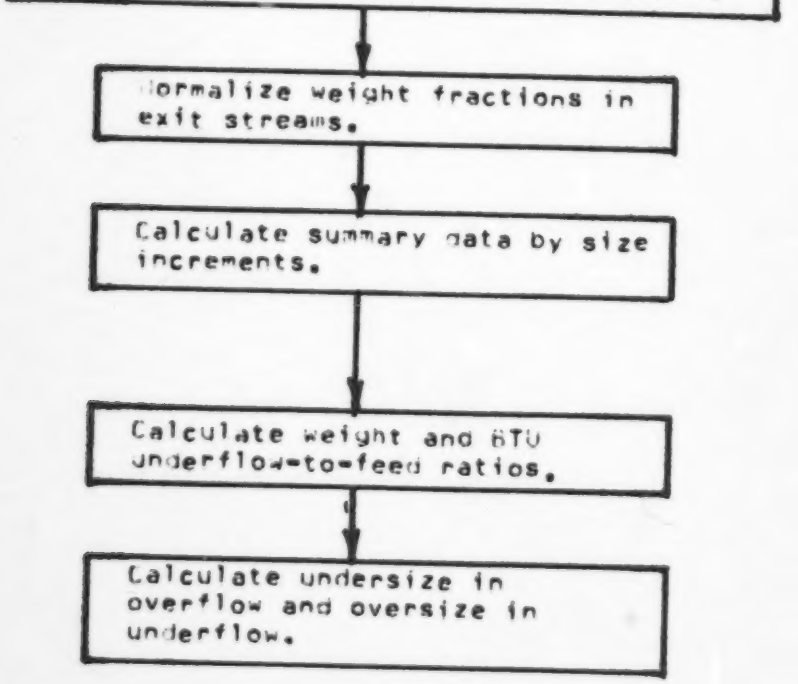

Calculate ratio of coal in coal product stream to coal in total feed after breaking.
Calculate coal/overflow and rock/underflow ratios.

SUBROUTINE SCREEN

This subroutine determines the weight distribution and composition of the screen over and screen under streams for a given feed.

Arguments required for subroutine:

Indication if screen is wet or dry , indication if screen is an upper or lower screen , projected screen opening , boundaries of coal size increments , number of size increments , number of gravity increments , properties of feed stream , properties of overflow stream , overflow product flow rate , properties of underflow stream , underflow product flow rate , size increment of coal , specific gravity increment of coal , weight, ash, pyritic sulphur and total sulphur , percent of feed of the ith size reporting to the underflow stream.



SUBROUTINE SDSIZE

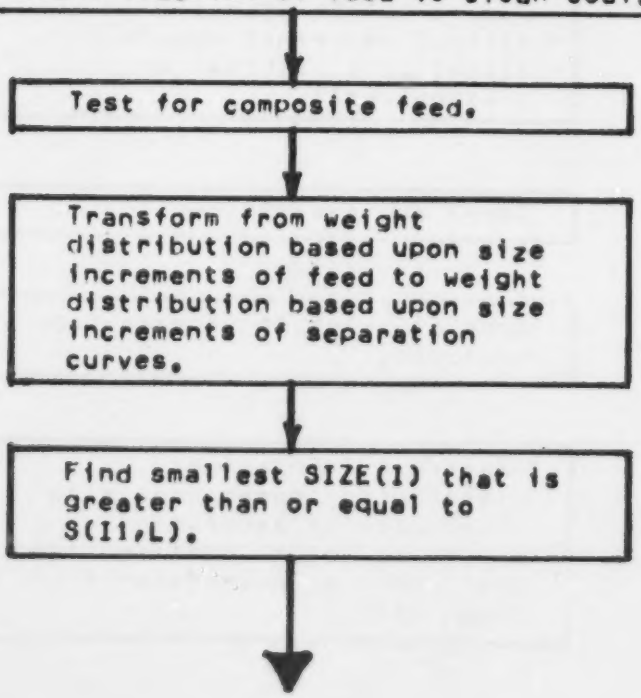
This subroutine calculates composition of flow streams by size increments.

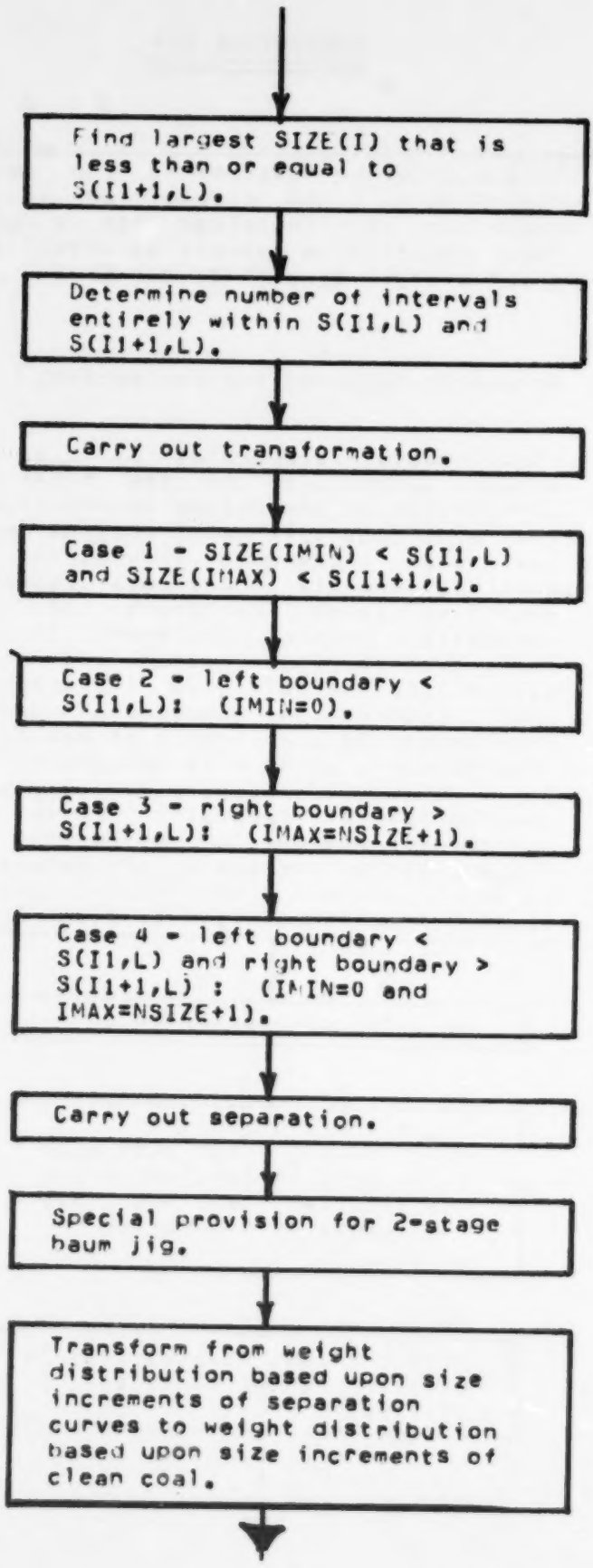
SUBROUTINE SEP

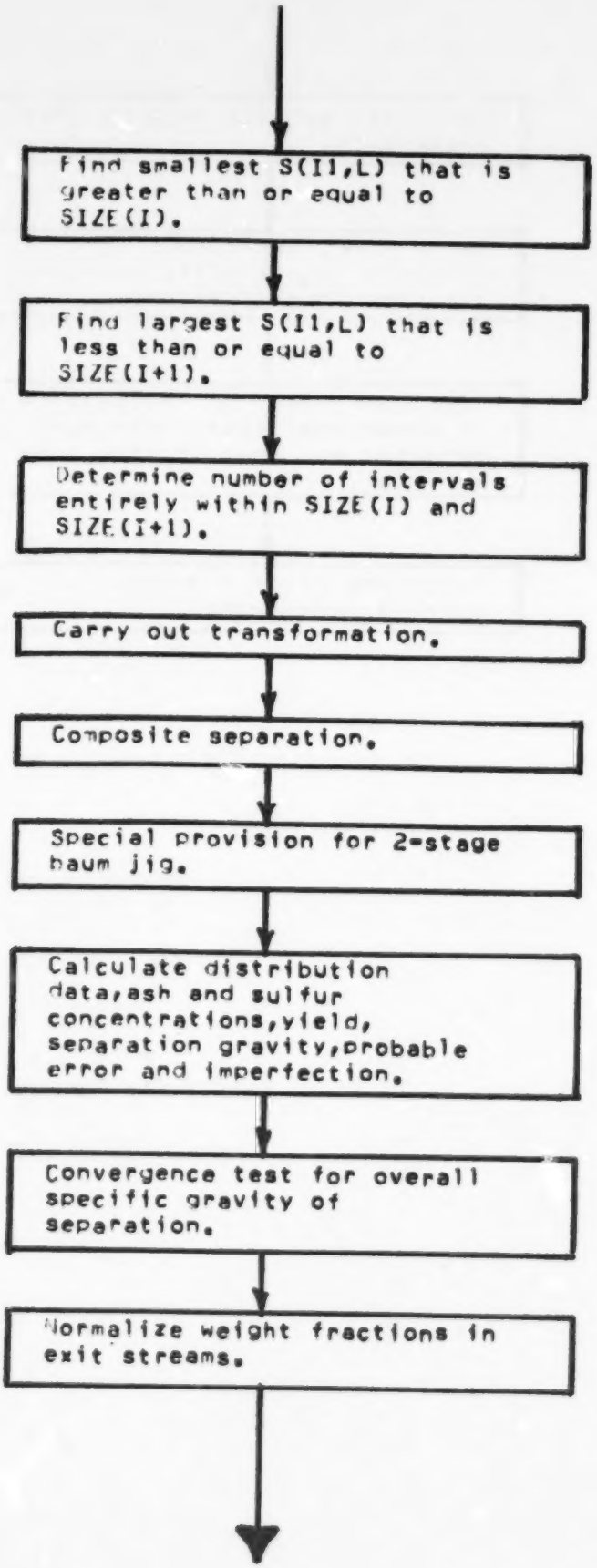
This subroutine determines the weight distribution and composition of the clean coal and the refuse for a given feed entering a specified vessel at a given overall separation gravity.

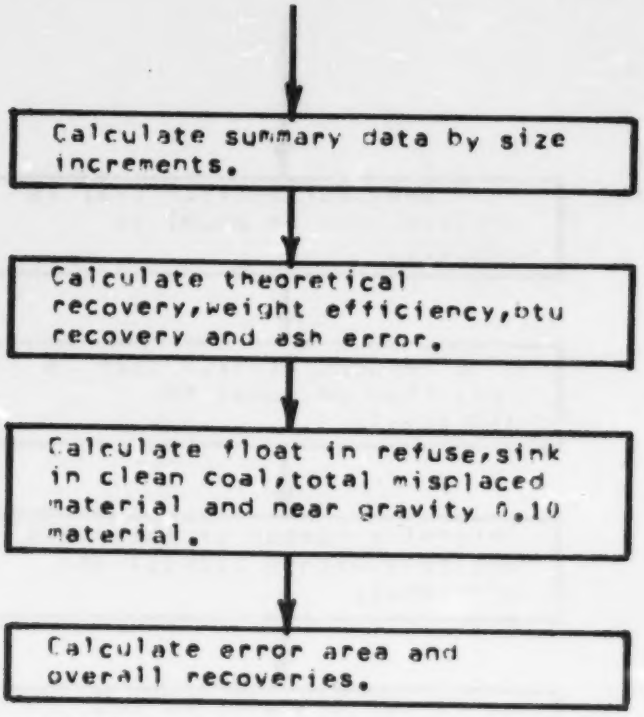
Arguments required for subroutine:

Flow streams ,properties of the feed stream ,properties of the clean coal ,properties of the refuse ,properties of the middlings (jig only) ,boundaries of coal size increments ,boundaries of specific gravity increments ,specific gravities ,size increment of coal ,specific gravity increment of coal ,weight,ash,pyritic sulfur and total sulfur ,number of size increments of coal ,number of specific gravity increments of coal ,ratio of separation gravity for a given size designation to the overall separation gravity ,boundaries of separation curve size increments ,number of sizes for each vessel ,size increment of separation curve ,overall seperation gravity ,weight fraction of feed to clean coal.




Find largest SIZE(I) that is less than or equal to S(I1+1,L).
Determine number of intervals entirely within S(I1,L) and S(I1+1,L).
Carry out transformation.
Case 1 - SIZE(IMIN) < S(I1,L) and SIZE(IMAX) < S(I1+1,L).
Case 2 - left boundary < S(I1,L): (IMIN=0).
Case 3 - right boundary > S(I1+1,L): (IMAX=NSIZE+1).
Case 4 - left boundary < S(I1,L) and right boundary > S(I1+1,L) : (IMIN=0 and IMAX=NSIZE+1).
Carry out separation.
Special provision for 2-stage baum jig.
Transform from weight distribution based upon size increments of separation curves to weight distribution based upon size increments of clean coal.


Find smallest S(I1,L) that is greater than or equal to SIZE(I).
Find largest S(I1,L) that is less than or equal to SIZE(I+1).
Determine number of intervals entirely within SIZE(I) and SIZE(I+1).
Carry out transformation.
Composite separation.
Special provision for 2-stage baum jig.
Calculate distribution data,ash and sulfur concentrations,yield, separation gravity,probable error and imperfection.
Convergence test for overall specific gravity of separation.
Normalize weight fractions in exit streams.


Calculate summary data by size increments.
Calculate theoretical recovery,weight efficiency,btu recovery and ash error.
Calculate float in refuse,sink in clean coal,total misplaced material and near gravity 0.10 material.
Calculate error area and overall recoveries.

SUBROUTINE SPLIT

This subroutine causes a flowstream (FEED) to be split into two distinct flowstreams (PROD1 and PROD2) having the same compositions. F represents the fraction of feed going into PROD1.

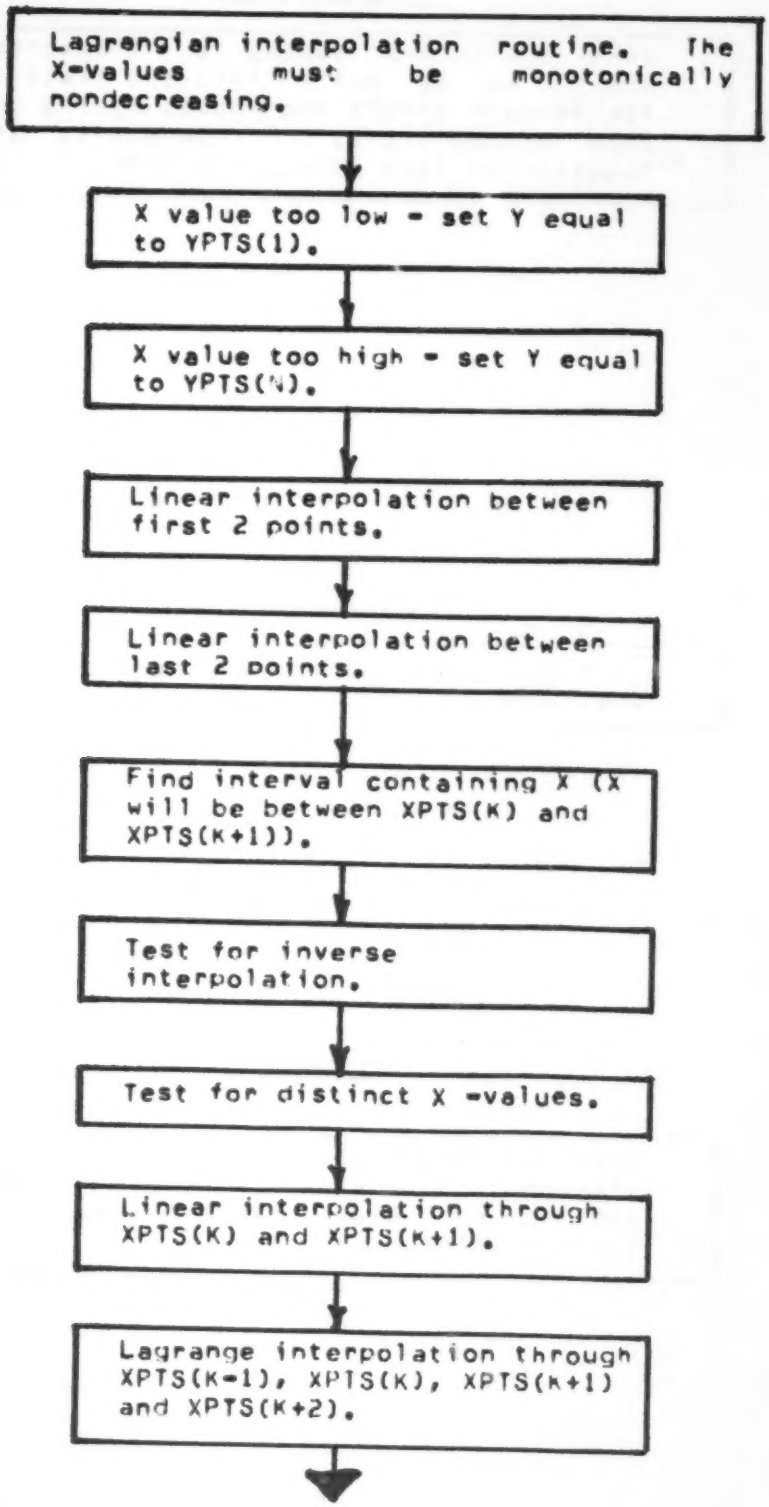
SUBROUTINE VESSEL

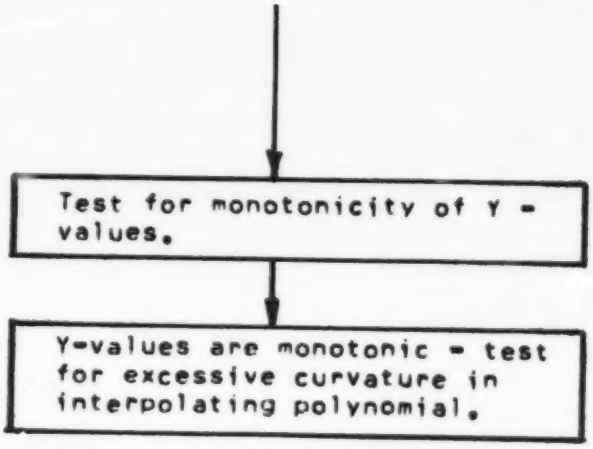
This subroutine prints the name of each coal washing unit.

FUNCTION Y

This function evaluates a point on the distribution curve for a given vessel and given size using Lagrangian interpolation.

FUNCTION YINTRP




Test for monotonicity of Y - values.
Y-values are monotonic - test for excessive curvature in interpolating polynomial.

7.2.3 Common Storage Areas

The program includes four common storage areas: blank (unlabeled) common, BLK1, BLK2 and SYS. The subprograms that share each common storage area are listed below.

Blank	BLK1	BLK2	SYS
MAIN	MAIN	MAIN	MAIN
FROTH	BLEND	FROTH	OUTPT1
OUTPT4	CRUSH	OUTPT2	OUTPT2
ROTARY	FROTH	SEP	OUTPT3
SCREEN	OUTPT2		OUTPT4
SEP	ROTARY		ROTARY
	SCREEN		VESSEL
	SEP		
	SPLIT		

7.3 Program Listing

The simulator has been written in standard ANSI Fortran IV. It should therefore be compatible with any commercial Fortran IV compiler.

A listing of the complete Fortran program is shown on the following pages.

```
00001
00002   C ***********************************************************************
00003   C                                                                      *
00004   C     C O A L   P R E P A R A T I O N   P L A N T   S I M U L A T O R  *
00005   C                                                                      *
00006   C THIS PROGRAM SIMULATES THE PERFORMANCE OF A COAL PREPARATION PLANT   *
00007   C WHOSE CONFIGURATION IS SPECIFIED.                                    *
00008   C     THIS PROGRAM WAS DEVELOPED AT THE UNIVERSITY OF PITTSBURGH       *
00009   C     FOR THE UNITED STATES BUREAU OF MINES UNDER GRANT NO. GO-155030  *
00010   C     COMPLETED AUGUST, 1977                                           *
00011   C     PRINCIPAL INVESTIGATOR: B. S. GOTTFRIED, PROFESSOR OF INDUSTRIAL *
00012   C        ENGINEERING, UNIVERSITY OF PITTSBURGH                         *
00013   C     OTHER PRINCIPAL CONTRIBUTORS: A. VAILLANT, AUTOMATED PROCESS     *
00014   C        SURVEYS, INC., NEW YORK CITY (CRUSHER, SCREEN AND BREAKER      *
00015   C        ROUTINES)                                                     *
00016   C     P. S. JACOBSEN, U. S. BUREAU OF MINES (WASHABILITY CALCULATIONS) *
00017   C                                                                      *
00018   C                                                                      *
00019   C PRINCIPAL ARRAYS AND VARIABLES                                       *
00020   C                                                                      *
00021   C     IU          = UNIT INDEX (FLOWSHEET IDENTIFICATION)              *
00022   C                     (SPECIFY IN ORDER THAT CALCULATIONS WILL BE       *
00023   C                      CARRIED OUT)                                    *
00024   C     L(IU)       = DESIGNATES TYPE OF UNIT                            *
00025   C                     L= 1 FOR CONCENTRATING TABLE                     *
00026   C                     L= 2 FOR DENSE-MEDIUM VESSEL                     *
00027   C                     L= 3 FOR DENSE-MEDIUM CYCLONE                    *
00028   C                     L= 4 FOR HYDROCYCLONE                            *
00029   C                     L= 5 FOR SINGLE-STAGE BAUM JIG                   *
00030   C                     L= 6 FOR 2-STAGE BAUM JIG                        *
00031   C                     L= 7 FOR FROTH FLOTATION CELL                    *
00032   C                                                                      *
00033   C                     L=11 FOR ROTARY BREAKER                          *
00034   C                     L=12 FOR PRIMARY MULTIPLE ROLL CRUSHER           *
00035   C                     L=13 FOR PRIMARY GYRATORY/JAW CRUSHER            *
00036   C                     L=14 FOR PRIMARY SINGLE ROLL CRUSHER             *
00037   C                     L=15 FOR PRIMARY CAGE MILL CRUSHER               *
00038   C                     L=16 FOR SECONDARY MULTIPLE ROLL CRUSHER         *
00039   C                     L=17 FOR SECONDARY GYRATORY/JAW CRUSHER          *
00040   C                     L=18 FOR SECONDARY SINGLE ROLL CRUSHER           *
00041   C                     L=19 FOR SECONDARY CAGE MILL CRUSHER             *
00042   C                                                                      *
00043   C                     L=21 FOR DRY UPPER SCREEN                        *
00044   C                     L=22 FOR DRY LOWER SCREEN                        *
00045   C                     L=23 FOR WET UPPER SCREEN                        *
00046   C                     L=24 FOR WET LOWER SCREEN                        *
00047   C                                                                      *
00048   C                     L=41 FOR STREAM BLENDER                          *
00049   C                                                                      *
00050   C                     L=51 FOR STREAM SPLITTER                         *
00051   C     D1(IU)      = UNIT DECISION VARIABLE                             *
00052   C     D2(IU)      = UNIT DECISION VARIABLE                             *
00053   C     D3(IU)      = UNIT DECISION VARIABLE                             *
00054   C     VSLYLD(IU)  = YIELD FOR A GIVEN UNIT .                           *
00055   C     VSLBTU(IU)  = BTU RECOVERY FOR GIVEN UNIT                        *
00056   C                                                                      *
```

```
00057  C     IF
00058  C     KF(1,IF)    * FLOWSTREAM INDEX (FLOWSHEET IDENTIFICATION)
00059  C     KF(2,IF)    * UNIT DESIGNATION OF FLOWSTREAM ORIGIN
00060  C                     (0 INDICATES AN EXTERNAL ORIGIN)
00061  C     FLOW(IF)    * UNIT DESIGNATION OF FLOWSTREAM DESTINATION
00062  C                     (0 INDICATES AN EXTERNAL DESTINATION)
00063  C     S(IF)       * FLOW RATE, EXPRESSED AS A FRACTION OF THE PLANT
00064  C                     FEED STREAM
00065  C                 * SYMBOL INDICATING TYPE OF FLOWSTREAM
00066  C                       C   INDICATES A CLEAN COAL STREAM
00067  C                       M   INDICATES A MIDDLINGS STREAM
00068  C                       R   INDICATES A REFUSE STREAM
00069  C                       U   INDICATES A SCREEN OVERFLOW (UPPER) STREAM
00070  C                               OR A SPLITTER OVERFLOW (UPPER) STREAM
00071  C                       L   INDICATES A SCREEN UNDERFLOW (LOWER) STREAM
00072  C                               OR A SPLITTER UNDERFLOW (LOWER) STREAM
00073  C     IJK         * INDEX REPRESENTING I,J OR K IN EQUIVALENT
00074  C                     3-DIMENSIONAL ARRAY
00075  C     SG(IJK,IF)  * SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM
00076  C
00077  C     I           * DESIGNATES SIZE INCREMENT OF COAL
00078  C     J           * DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL
00079  C     K           * DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR
00080  C                     (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE ENTIRE
00081  C                     STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)
00082  C     SIZE(I)     * BOUNDARIES OF COAL SIZE INCREMENTS
00083  C     WT(I)       * WEIGHT OF COAL IN VARIOUS SIZE INCREMENTS
00084  C     GBOUND(J)   * BOUNDARIES OF SPECIFIC GRAVITY INCREMENTS
00085  C     GRAV(J)     * SPECIFIC GRAVITIES
00086  C     FEED(I,J,K) * PROPERTIES OF THE FEED STREAM
00087  C     CC(I,J,K)   * PROPERTIES OF THE CLEAN COAL
00088  C     REF(I,J,K)  * PROPERTIES OF THE REFUSE
00089  C     MID(I,J,K)  * PROPERTIES OF THE MIDDLINGS
00090  C
00091  C     NUNITS      * NUMBER OF UNITS IN PLANT CONFIGURATION
00092  C                     MAXIMUM VALUE IS 30
00093  C     NFLOWS      * NUMBER OF FLOWSTREAMS IN PLANT CONFIGURATION
00094  C                     MAXIMUM VALUE IS 25
00095  C     NRETRT      * NUMBER OF RETREATMENT STREAMS
00096  C                     MAXIMUM VALUE IS 3
00097  C     NSIZE       * NUMBER OF SIZE INCREMENTS OF COAL
00098  C                     MAXIMUM VALUE IS 22
00099  C     NGRAV       * NUMBER OF SPECIFIC GRAVITY INCREMENTS OF COAL
00100  C                     MAXIMUM VALUE IS 16
00101  C     IOUT        * OUTPUT LEVEL DESIGNATION
00102  C                       IOUT=0 FOR MINIMUM OUTPUT
00103  C                         (SPECIFIC GRAVITY ANALYSIS OF FEED AND
00104  C                         OVERALL PLANT SUMMARY)
00105  C                       IOUT=1 FOR MORE DETAILED OUTPUT
00106  C                         (SPECIFIC GRAVITY ANALYSIS OF FEED AND
00107  C                         PRODUCT STREAMS, SUMMARY OF EACH UNIT AND
00108  C                         OVERALL PLANT SUMMARY)
00109  C                       IOUT=2 FOR MOST DETAILED OUTPUT
00110  C                         (SPECIFIC GRAVITY ANALYSIS OF ALL FLOWSTREAMS,
00111  C                         SUMMARY OF EACH UNIT AND OVERALL PLANT SUMMARY)
00112  C                       IOUT=3 FOR DEBUGGING ONLY
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00113   C                          (COMPLETE OUTPUT FOR EACH ITERATION)                  *
00114   C      NCOMP       = INDICATES HOW SEPARATIONS WILL BE DETERMINED                *
00115   C                    NCOMP=0 FOR SEPARATION BY SIZE INCREMENTS                    *
00116   C                    NCOMP=1 FOR SEPARATION USING COMPOSITE CURVE                 *
00117   C      ICOUNT      = ITERATION COUNTER FOR RETREATMENT STREAMS                    *
00118   C      KCONVG      = CONVERGENCE INDICATOR                                       *
00119   C                    KCONVG=0 INDICATES A NONCONVERGENT CONDITION                 *
00120   C                    KCONVG=1 INDICATES THAT CONVERGENCE HAS BEEN                 *
00121   C                      ATTAINED                                                   *
00122   C                                                                                 *
00123   C BTU CONTENT OF COAL IS CALCULATED AS FOLLOWS:                                   *
00124   C      BTU/LB = MAXIMUM OF: (BTU(1)+100.*BTU(2)*FEED(I,J,2)+100.*BTU(3)*         *
00125   C                FEED(I,J,2)**2.    BTU(4))                                     *
00126   C                                                                                 *
00127   C INPUT/OUTPUT UNIT DESIGNATIONS:                                                 *
00128   C      G           = THE INPUT DEVICE NUMBER (CARD READER)                       *
00129   C      H           = THE OUTPUT DEVICE NUMBER (LINE PRINTER)                     *
00130   C                                                                                 *
00131   C TO CHANGE UNIT DESIGNATIONS, ALTER THE STATEMENTS LABELED  * SYS *              *
00132   C      IN COLS 73-80     (2 STATEMENTS)                                           *
00133   C                                                                                 *
00134   C TO CHANGE DIMENSIONS, ALTER APPROPRIATE STATEMENTS LABELED * DIM *              *
00135   C      IN COLS 73-80                                                              *
00136   C                                                                                 *
00137   C TO CHANGE THE MAXIMUM NUMBER OF FLOWSTREAMS, ALTER THE FOLLOWING ARRAYS:       *
00138   C      MAIN:    SG,KF,FLOW,S AND KPOINT                                         *
00139   C      EXPAND: X                                                                  *
00140   C      REDUCE: Y                                                                  *
00141   C      OUTPT4: SG,KF,FLOW AND S                                                   *
00142   C      ALSO, THE STATEMENT 'KPOINT(IF)=NRETRT+25' IN MAIN (JUST BEFORE            *
00143   C         STATEMENT NO. 70) MUST BE MODIFIED                                      *
00144   C                                                                                 *
00145   C TO CHANGE THE MAXIMUM NUMBER OF UNITS, ALTER THE FOLLOWING ARRAYS:              *
00146   C      MAIN:    D1,D2,D3,L,VSLYLD AND VSLBTU                                    *
00147   C      OUTPT4: D1,D2,D3,L,VSLYLD AND VSLBTU                                      *
00148   C                                                                                 *
00149   C *********************************************************************************
00150         DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),MID(23,10,4),     * DIM *
00151        1 SG(920,28),SYMBOL(6,23),KF(2,25),SIZE(23),GBOUND(11),GRAV(10),    * DIM *
00152        2 FLOW(28),S(25),TITLE(20),D1(30),D2(30),D3(30),L(30),KPOINT(25),   * DIM *
00153        3 C1(3),C2(3),VSLYLD(30),VSLBTU(30),WT(23),BTU(4)                   * DIM *
00154         COMMON SCR(5629)                                                   * DIM *
00155         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),         * DIM *
00156        1              SYLD(24),TYLD(24),EFFTC(24),STUREC(24),ASHERR(24),  * DIM *
00157        2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),   * DIM *
00158        3              SPE(24),SIMP(24),SEA(24)                            * DIM *
00159         COMMON /BLK2/ DISTRB(24,10)                                        * DIM *
00160         COMMON /SYS/ G,H
00161         INTEGER G,H
00162         INTEGER PSJ
00163         REAL MID
00164         DATA S1,S2,S3,S4,S5,S6 / 1HC,1HM,1HR,1HU,1HL,1H  /                 * DIM *
00165       100 FORMAT(20A4)
00166       101 FORMAT(26I3)
00167       102 FORMAT(I3,2X,F5.3,2X,F5.3,2X,F5.3)
00168       103 FORMAT(2I3,2X,A1)
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00169      104 FORMAT(8(6A1,4X))
00170      105 FORMAT(13(1X,F5.3))
00171      106 FORMAT(8(F7.5,3X))
00172      200 FORMAT(1H1,20X,43HC O A L  P R E P A R A T I O N  P L A N T,
00173         1 20H  S I M U L A T O R///,1H0,20X,20A4//)
00174      201 FORMAT(1H0,10X,11HUNIT NUMBER,24X,9HUNIT TYPE,24X,
00175         1 18HDECISION VARIABLES)
00176      202 FORMAT(1H0,14X,I2,23X,I2)
00177      203 FORMAT(1H+,89X,F5.3)
00178      204 FORMAT(1H0,7X,17HFLOWSTREAM NUMBER,15X,20HORIGIN = UNIT NUMBER,
00179         1 16X,25HDESTINATION = UNIT NUMBER)
00180      205 FORMAT(1H0,14X,I2,32X,I2,2X,A2,30X,I2)
00181      206 FORMAT(1H+,18X,6H(FEED))
00182      207 FORMAT(1H+,18X,20H(CLEAN COAL PRODUCT))
00183      208 FORMAT(1H+,18X,19H(MIDDLINGS PRODUCT))
00184      209 FORMAT(1H+,18X,16H(REFUSE PRODUCT))
00185      210 FORMAT(1H+,18X,20H(RETREATMENT STREAM))
00186      211 FORMAT(1H+,84X,F6.3)
00187      212 FORMAT(1H+,75X,F6.3,2X,F6.3,2X,F6.3)
00188      300 FORMAT(1H0,58X,17HITERATION NUMBER ,I2/)
00189      301 FORMAT(1H1,37X,58HSUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UN
00190         1IT NUMBER ,I2/)
00191      302 FORMAT(1H0,48X,33HSPECIFIC GRAVITY OF SEPARATION = ,F4.2/)
00192      303 FORMAT(1H0,22X,9HLENGTH = ,F5.2,5H FEET,10X,11HDIAMETER = ,F5.2,
00193         1 5H FEET,10X,18HSIZE OF OPENING = ,F4.2,7H INCHES/)
00194      304 FORMAT(1H0,52X,18HCRUSHER SETTING = ,F4.2,7H INCHES/)
00195      305 FORMAT(1H0,52X,18HSIZE OF OPENING = ,F4.2,7H INCHES/)
00196      306 FORMAT(1H0,48X,20HUPPER FLOW STREAM = ,F4.1,16H PERCENT OF FEED/)
00197      400 FORMAT(1H1,47X,33HSPECIFIC GRAVITY ANALYSIS OF FEED/)
00198      401 FORMAT(1H1,37X,47HSPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER ,
00199         1 I2/)
00200      402 FORMAT(1H0,5X,28HFLOWRATE, PERCENT OF FEED = ,F5.1/,
00201         1 1H0,5X,22HBTU CONTENT, BTU/LB = ,F6.0/,
00202         2 1H0,5X,22HLBS SO2/MILLION BTU = ,F4.2)
00203      403 FORMAT(1H1,27X,47HSPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT,
00204         1 18H FROM UNIT NUMBER ,I2/)
00205      404 FORMAT(1H1,27X,64HSPECIFIC GRAVITY ANALYSIS OF MIDDLINGS PRODUCT F
00206         1ROM UNIT NUMBER ,I2/)
00207      405 FORMAT(1H1,27X,61HSPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM
00208         1 UNIT NUMBER ,I2/)
00209      406 FORMAT(1H0,31X,21HORIGIN = UNIT NUMBER ,I3,2X,A2,8X,26HDESTINATION
00210         1 = UNIT NUMBER ,I3/)
00211      500 FORMAT(1H1,120(1H*)/,2H *,118X,1H*/,2H *,34X,36HCONVERGENCE HAS BE
00212         1EN ATTAINED AFTER ,I3,11H ITERATIONS,34X,1H*/,2H *,118X,1H*/,1H ,1
00213         220(1H*))
00214      501 FORMAT(1H0,52X,17HITERATION NUMBER ,I2/)
00215      502 FORMAT(1H1,120(1H*)/,2H *,118X,1H*/,2H *,32X,40HTHE COMPUTATION HA
00216         1S NOT CONVERGED AFTER ,I3,11H ITERATIONS,32X,1H*/,2H *,118X,1H*/,1
00217         2H ,120(1H*))
00218      503 FORMAT(1H0,5X,23HNUMBER OF ITERATIONS = ,I3)
00219      600 FORMAT(1H0,60(2H= )/)
00220      601 FORMAT(1H0,9X,7HNUNITS=,I3,8X,7HNFLOWS=,I3,8X,6HNSIZE=,I3,8X,
00221         1 6HNGRAV=,I3,8X,5HIOUT=,I3,8X,6HICMAX=,I3,8X,6HNCOMP=,I3/)
00222      900 FORMAT(1H1)
00223    C SET NUMERICAL PARAMETERS
00224        GO5
```

```
      H=6
      NFALL=70                                                          * SYS *
      EPSLN1=0.001
      EPSLN2=0.001
      KCONVG=1
C ***********************************************************************
C READ INPUT DATA                                                       *
C ***********************************************************************
      READ (G,100) TITLE
      READ (G,101) NUNITS,NFLOWS,NSIZE,NGRAV,IOUT,ICMAX,NCOMP,PSJ
      IF (ICMAX.EQ.0) ICMAX=50
      IF (NCOMP.NE.0) NSIZE=1
      NS=NSIZE+1
      NG=NGRAV+1
      READ (G,102) ((L(IU),D1(IU),D2(IU),D3(IU)),IU=1,NUNITS)
      READ (G,103) ((KF(1,IF),KF(2,IF),S(IF)),IF=1,NFLOWS)
      READ (G,104) ((SYMBOL(K,I),K=1,6),I=1,NS)                         * DIM *
      READ (G,105) (WT(I),I=1,NSIZE)
      READ (G,105) (GBOUND(J),J=1,NG)
C          NOTE CHANGE IN READ FROM ORIGINAL PROGRAM
C          BTU(4)=MINIMUM BTU; BTU(1)=CONSTANT TERM
C          BTU(2)=LINEAR TERM; BTU(3)=SQUARED TERM.
      READ (G,106) BTU(4),BTU(1),BTU(2),BTU(3)
      CALL CONVRT(SYMBOL,SIZE,NSIZE)
      DO 1 J=1,NGRAV
    1 GRAV(J)=.5*(GBOUND(J)+GBOUND(J+1))
      SUM1=0.
      DO 2 I=1,NSIZE
      SUM1=SUM1+WT(I)
      DO 2 J=1,NGRAV
      READ (G,106) (FEED(I,J,K),K=1,4)                                  * DIM *
      IF (FEED(I,J,1).EQ.0.) FEED(I,J,1)=1.E-6
    2 CONTINUE
      DO 4 I=1,NSIZE
      SUM2=0.
      DO 3 J=1,NGRAV
    3 SUM2=SUM2+FEED(I,J,1)
      DO 4 J=1,NGRAV
      FEED(I,J,1)=(WT(I)/SUM1)*(FEED(I,J,1)/SUM2)
      FEED(I,J,2)=.01*FEED(I,J,2)
      FEED(I,J,3)=.01*FEED(I,J,3)
    4 FEED(I,J,4)=.01*FEED(I,J,4)
C ***********************************************************************
C WRITE INPUT DATA                                                      *
C ***********************************************************************
      WRITE (H,200) TITLE
      WRITE (H,600)
      WRITE (H,201)
      DO 5 IU=1,NUNITS
      WRITE (H,202) IU,L(IU)
      IF ((L(IU).EQ.7).OR.(L(IU).EQ.41)) GO TO 5
      IF (L(IU).NE.11) WRITE (H,211) D1(IU)
      IF (L(IU).EQ.11) WRITE (H,212) D1(IU),D2(IU),D3(IU)
    5 CALL VESSEL(L(IU),1)
      WRITE (H,600)
      WRITE (H,204)
```

```
00281          DO 6 IF=1,NFLOWS
00282          WRITE (H,205) IF,KF(1,IF),S(IF),KF(2,IF)
00283          IF (KF(1,IF).EQ.0) WRITE (H,206)
00284          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S1)) WRITE (H,207)
00285          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S2)) WRITE (H,208)
00286          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S3)) WRITE (H,209)
00287          IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 6
00288          WRITE (H,210)
00289        6 CONTINUE
00290          WRITE (H,600)
00291          WRITE (H,601) NUNITS,NFLOWS,NSIZE,NGRAV,IOUT,ICMAX,NCOMP
00292          WRITE (H,400)
00293          CALL OUTPT1(FEED,SYMBOL,GBOUND,BTU,FLBTU,FLSG2,NSIZE,NGRAV,NCOMP)
00294          CALL OUTPT3(FEED,BTU,1.,NSIZE,NGRAV)
00295    C *****************************************************************************
00296    C INITIALIZE FEED AND RETREATMENT STREAMS                                      *
00297    C *****************************************************************************
00298          ICOUNT=0
00299          NRETRT=0
00300          DO 8 IF=1,NFLOWS
00301          IG=IF
00302          IF (KF(1,IF).NE.0) GO TO 7
00303    C INITIALIZE FEED STREAM
00304          CALL REDUCE (FEED,SG,IG,NSIZE,NGRAV)
00305          FLOW(IF)=1.
00306          GO TO 8
00307        7 IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 8
00308    C INITIALIZE RETREATMENT STREAMS
00309          NRETRT=NRETRT+1
00310          KPOINT(IF)=NRETRT+25
00311          DO 70 I=1,920                                                  * DIM *
00312          SG(I,IF)=0.                                                    * DIM *
00313       70 SG(I,KPOINT(IF))=0.
00314          FLOW(IF)=0.
00315          FLOW(KPOINT(IF))=0.
00316          C2(NRETRT)=0.
00317          IF (IOUT.LT.3) GO TO 8
00318          WRITE (H,401) KPOINT(IF)
00319          CALL EXPAND(SG,MID,IG,NSIZE,NGRAV)
00320          CALL OUTPT1(MID,SYMBOL,GBOUND,BTU,FLBTU,FLSG2,NSIZE,NGRAV,NCOMP)
00321          CALL OUTPT3(MID,BTU,FLOW(KPOINT(IF)),NSIZE,NGRAV)
00322        8 CONTINUE
00323          IF (NRETRT.GT.0) KCONVG=0
00324    C CALCULATE COUNTER TO BE USED IN CONVERGENCE TEST ON WEIGHT DISTRIBUTION
00325    C FOR RETREATMENT STREAMS. (SEE THE STMT "DO 51 I= ... " FOR USE OF NCONVG)
00326    C
00327    C   NCONVG = NSIZE*NGRAV*4-3 = INDEX OF THE LAST NONTRIVIAL WEIGHT VALUE IN 'SG'
00328    C   WHERE THE INDEX OF THE M-TH WEIGHT VALUE IN 'SG' IS GIVEN BY " 1+4(M-1) "
00329    C   (SEE SUBROUTINE REDUCE)
00330          NCONVG=NSIZE*NGRAV*4-3
00331    C *****************************************************************************
00332    C CARRY OUT UNIT OPERATIONS IN THE ORDER THAT THE UNITS ARE SPECIFIED          *
00333    C IN THE INPUT DATA                                                            *
00334    C *****************************************************************************
00335        9 ICOUNT=ICOUNT+1
00336          IF (ICOUNT.GE.ICMAX-1) IOUT=3
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```
00337          KBSG=KCONVG
00338          IF (IOUT.EQ.3) KBSG=1
00339          DO 25 IU=1,NUNITS
00340    C EXPAND INPUT STREAMS
00341          DO 10 IF=1,NFLOWS
00342          IG=IF
00343          IF (KF(2,IF).NE.IU) GO TO 10
00344          CALL EXPAND(SG,FEED,IG,NSIZE,NGRAV)
00345          FLOW1=FLOW(IF)
00346          IF (L(IU).NE.41) GO TO 13
00347          KFLAG=IF+1
00348          GO TO 11
00349       10 CONTINUE
00350    C STREAM BLENDER = EXPAND SECOND INPUT STREAM
00351       11 DO 12 IF=KFLAG,NFLOWS
00352          IG=IF
00353          IF (KF(2,IF).NE.IU) GO TO 12
00354          CALL EXPAND(SG,MID,IG,NSIZE,NGRAV)
00355          FLOW2=FLOW(IF)
00356       12 CONTINUE
00357    C CARRY OUT OPERATIONS
00358       13 IF (L(IU).LE.6) CALL SEP(FEED,CC,REF,MID,SIZE,GRAV,GBOUND,D1(IU),
00359         1                         YLDCC,YLDMID,YLDREF,NSIZE,NGRAV,L(IU),
00360         2                         NCOMP,VSLYLD(IU),VSLBTU(IU),BTU,KBSG)
00361          IF (L(IU).EQ.7) CALL FROTH(FEED,CC,REF,SIZE,GRAV,GBOUND,YLDCC,
00362         1                           YLDREF,NSIZE,NGRAV,NCOMP,VSLYLD(IU),
00363         2                           VSLBTU(IU),BTU,KBSG)
00364          IF (L(IU).EQ.11) CALL ROTARY(D1(IU),D2(IU),D3(IU),SIZE,NSIZE,
00365         1                             NGRAV,FEED,CC,YLDCC,REF,YLDREF,
00366         2                             VSLYLD(IU),VSLBTU(IU),BTU,KBSG)
00367    C
00368    C
00369    C
00370          IF ((L(IU).GE.12).AND.(L(IU).LE.19)) CALL CRUSH(L(IU),D1(IU),SIZE,
00371         1                                        NSIZE,NGRAV,FEED,CC,YLDCC,
00372         2                                        VSLYLD(IU),VSLBTU(IU),BTU,
00373         3                                        KBSG)
00374          IF ((L(IU).GE.21).AND.(L(IU).LE.24)) CALL SCREEN(L(IU),D1(IU),
00375         1                                SIZE,NSIZE,NGRAV,FEED,CC,YLDCC,REF,YLDREF,
00376         2                                VSLYLD(IU),VSLBTU(IU),BTU,KBSG)
00377          IF (L(IU).EQ.41) CALL BLEND(FEED,MID,CC,FLOW1,FLOW2,FPROD,
00378         1                            NSIZE,NGRAV,VSLYLD(IU),VSLBTU(IU),BTU,
00379         2                            KBSG)
00380          IF (L(IU) .EQ.51) CALL SPLIT(FEED,CC,REF,BTU,YLDCC,YLDREF,D1(IU),
00381         1                             NSIZE,NGRAV,VSLYLD(IU),VSLBTU(IU),
00382         2                             KBSG)
00383    C  WRITE OPTIONAL UNIT SUMMARY
00384          IF (IOUT.LT.1) GO TO 14
00385          IF ((IOUT.LE.2).AND.(KCONVG.EQ.0)) GO TO 14
00386          WRITE (H,301) IU
00387          CALL VESSEL(L(IU),2)
00388          IF (L(IU).LE.6) WRITE (H,302) D1(IU)
00389          IF (L(IU).EQ.11) WRITE (H,303) D1(IU),D2(IU),D3(IU)
00390          IF ((L(IU).GE.12).AND.(L(IU).LE.19)) WRITE (H,304) D1(IU)
00391          IF ((L(IU).GE.21).AND.(L(IU).LE.24)) WRITE (H,305) D1(IU)
00392          IF (L(IU).EQ.51) WRITE (H,306) D1(IU)
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00393          IF (NRETRT.GT.0) WRITE (H,300) ICOUNT
00394          CALL OUTPT2(SYMBOL,NSIZE,NGRAV,NCOMP,L(IU),PBJ,GBOUND)
00395    C REDUCE PRODUCT STREAMS
00396       14 IF (L(IU).GE.12) GO TO 19
00397          DO 18 IF=1,NFLOWS
00398          IG=IF
00399          IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S1)) GO TO 15
00400          IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S2)) GO TO 16
00401          IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S3)) GO TO 17
00402          GO TO 18
00403       15 CALL REDUCE(CC,SG,IG,NSIZE,NGRAV)
00404          FLOW(IF)=YLDCC*FLOW1
00405          GO TO 18
00406       16 CALL REDUCE(MID,SG,IG,NSIZE,NGRAV)
00407          FLOW(IF)=YLDMID*FLOW1
00408          GO TO 18
00409       17 CALL REDUCE(REF,SG,IG,NSIZE,NGRAV)
00410          FLOW(IF)=YLDREF*FLOW1
00411       18 CONTINUE
00412          GO TO 25
00413       19 IF ((L(IU).LE.20).OR.(L(IU).EQ.41)) GO TO 23
00414          DO 22 IF=1,NFLOWS
00415          IG=IF
00416          IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S4)) GO TO 20
00417          IF ((KF(1,IF).EQ.IU).AND.(S(IF).EQ.S5)) GO TO 21
00418          GO TO 22
00419       20 CALL REDUCE(CC,SG,IG,NSIZE,NGRAV)
00420          FLOW(IF)=YLDCC*FLOW1
00421          GO TO 22
00422       21 CALL REDUCE(REF,SG,IG,NSIZE,NGRAV)
00423          FLOW(IF)=YLDREF*FLOW1
00424       22 CONTINUE
00425          GO TO 25
00426       23 DO 24 IF=1,NFLOWS
00427          IG=IF
00428          IF (KF(1,IF).NE.IU) GO TO 24
00429          CALL REDUCE(CC,SG,IG,NSIZE,NGRAV)
00430          IF (L(IU).EQ.41) FLOW(IF)=FPROD
00431          IF (L(IU).NE.41) FLOW(IF)=YLDCC*FLOW1
00432       24 CONTINUE
00433       25 CONTINUE
00434    C ***************************************************************************
00435    C WRITE OPTIONAL FLOWSTREAM SUMMARY (OUTPUT STREAMS)
00436    C ***************************************************************************
00437          IF (IOUT.LT.2) GO TO 27
00438          IF ((IOUT.EQ.2).AND.(KCONVG.EQ.0)) GO TO 27
00439          DO 26 IF=1,NFLOWS
00440          IG=IF
00441          WRITE (H,401) IF
00442          WRITE (H,406) KF(1,IF),S(IF),KF(2,IF)
00443          IF (NRETRT.GT.0) WRITE (H,501) ICOUNT
00444          CALL EXPAND(SG,CC,IG,NSIZE,NGRAV)
00445          CALL OUTPT1(CC,SYMBOL,GBOUND,BTU,FLBTU,FLBO2,NSIZE,NGRAV,NCOMP)
00446       26 CALL OUTPT3(CC,BTU,FLOW(IF),NSIZE,NGRAV)
00447       27 CONTINUE
00448    C ***************************************************************************
```

```
00449   C TEST RETREATMENT STREAMS FOR CONVERGENCE
00450   C ***************************************************************************************
00451      50 IF ((NRETRT.EQ.0).OR.(KCONVG.EQ.1)) GO TO 60
00452         DO 52 IF=1,NFLOWS
00453         IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 52
00454         DO 51 I=1,NCONVG,4
00455         DIFF=ABS(SG(I,IF)-SG(I,KPOINT(IF)))
00456         IF (DIFF.GT.EPSLN1) GO TO 53
00457      51 CONTINUE
00458         IF (ABS(FLOW(IF)-FLOW(KPOINT(IF))).GT.EPSLN2) GO TO 53
00459      52 CONTINUE
00460   C CONVERGED SOLUTION
00461         WRITE (H,500) ICOUNT
00462         IF (IOUT.EQ.3) GO TO 60
00463         KCONVG=1
00464         ICOUNT=ICOUNT-1
00465         GO TO 9
00466      53 IF (ICOUNT.LT.ICMAX) GO TO 54
00467   C CONVERGENCE NOT ATTAINED AFTER MAXIMUM NUMBER OF ITERATIONS -
00468   C TERMINATE COMPUTATION
00469         WRITE (H,502) ICOUNT
00470         GO TO 66
00471   C CONVERGENCE NOT ATTAINED - CONTINUE ITERATION
00472      54 KCOUNT=0
00473         DO 58 IF=1,NFLOWS
00474         IF ((KF(2,IF).EQ.0).OR.(KF(2,IF).GT.KF(1,IF))) GO TO 58
00475         KCOUNT=KCOUNT+1
00476         DO 55 I=1,920
00477      55 SG(I,KPOINT(IF))=SG(I,IF)                                          * DIM *
00478   C TEST FOR ODD VALUE OF ICOUNT
00479         IF ((ICOUNT+1)/2.GT.ICOUNT/2) GO TO 56
00480   C ICOUNT=2,4,6,8,...   APPLY ACCELERATION PROCEDURE
00481         IF (ICOUNT.EQ.0) GO TO 57
00482         FLOW(IF)=(FLOW(IF)*C2(KCOUNT)-C1(KCOUNT)**2)/(FLOW(IF)-
00483        1 2.*C1(KCOUNT)+C2(KCOUNT))
00484         C2(KCOUNT)=FLOW(IF)
00485         GO TO 57
00486   C ICOUNT=1,3,5,7,...   BYPASS ACCELERATION PROCEDURE
00487      56 C1(KCOUNT)=FLOW(IF)
00488      57 FLOW(KPOINT(IF))=FLOW(IF)
00489         IF (KCOUNT.EQ.NRETRT) GO TO 9
00490      58 CONTINUE
00491         WRITE (H,502) ICOUNT
00492         GO TO 66
00493   C ***************************************************************************************
00494   C CALCULATE OVERALL YIELD, ASH AND SULFUR FOR PRODUCT STREAMS                *
00495   C ***************************************************************************************
00496      60 IF (IOUT.EQ.0) GO TO 66
00497         DO 65 I=1,3
00498         DO 65 IF=1,NFLOWS
00499         IG=IF
00500         IF (KF(2,IF).NE.0) GO TO 65
00501         IF ((I.EQ.1).AND.((S(IF).EQ.S1).OR.(S(IF).EQ.S4))) GO TO 61
00502         IF ((I.EQ.2).AND.(S(IF).EQ.S2)) GO TO 62
00503         IF ((I.EQ.3).AND.((S(IF).EQ.S3).OR.(S(IF).EQ.S5))) GO TO 63
00504         GO TO 65
```

```
00505       61 WRITE (H,403) KF(1,IF)
00506          GO TO 64
00507       62 WRITE (H,404) KF(1,IF)
00508          GO TO 64
00509       63 WRITE (H,405) KF(1,IF)
00510       64 CALL EXPAND(SG,CC,IG,NSIZE,NGRAV)
00511          CALL OUTPT1(CC,SYMBOL,GBOUND,BTU,FLBTU,FLS02,NSIZE,NGRAV,NCOMP)
00512          CALL OUTPT3(CC,BTU,FLOW(IF),NSIZE,NGRAV)
00513       65 CONTINUE
00514          IF (NRETRT.GT.0) WRITE (H,503) ICOUNT
00515    C*****************************************************************************
00516    C CALCULATE AND PRINT SUMMARY DATA FOR ALL UNITS AND FLOWSTREAMS              *
00517    C*****************************************************************************
00518       66 CALL OUTPT4(SG,L,D1,D2,D3,VSLYLD,VSLBTU,KF,S,FLOW,NUNITS,NFLOWS,
00519         1              NSIZE,NGRAV,S1,S2,S3,S4,S5,S6,BTU)
00520          WRITE (H,900)
00521          STOP
00522          END
```

COMMON BLOCKS

```
/,COMM,/(+12775)
SCR          +0#R
/BLK1/(+1430)
SFEED        +0#R      SCC         +170#R      SMID        +360#R      SREF        +550#R      SYLD        +740#R
TYLD         +770#R    EFFIC       +1020#R     BTUREC      +1050#R     ASHERR      +1100#R     SFLT        +1130#R
SINK         +1160#R   SMISPL      +1210#R     SNRGR       +1240#R     SGRAV       +1270#R     SPE         +1320#R
SIMP         +1350#R   SEA         +1400#R

/BLK2/(+360)
DISTRB       +0#R

/SYS/(+2)
G            +0 I      H           +1 I
```

SUBPROGRAMS CALLED

REDUCE SPLIT SCREEN ROTARY SEP CONVRT EXPAND CRUSH FROTH ABS. VESSEL BLEND OUTPT1 OUTPT2 OUTPT3 OUTPT4

SCALARS AND ARRAYS ("*" NO EXPLICIT DECLARATION - "I" NOT REFERENCED - "#" SUBSCRIPTED)

```
*S3          1 R       VSLYLD      2#R       *NCOMP      40 I      *DIFF       41 R      *NS         42 I
*NUNITS     43 I       *IF         44 I       PSJ        45 I       FEED       46#R      *K        1676 I
 D3       1677#R       *NG       1735 I      *S2        1736 R      MID      1737#R       VSLBTU    3567#R
*KFLAG    3625 I        GBOUND    3626#R     *NCONVG     3641 I     *KCONVG    3642 I     *FPROD    3643 R
 SYMBOL   3644#R        D2        4056#R     *IOUT       4114 I     *FLOW2     4115 R     *KBSG     4116 I
*S1       4117 R        S         4120#R      KF         4151#I     *YLDMID    4233 R      KPOINT   4234#I
*IU       4265 I       *YLDREF    4266 R     *J          4267 I      SG        4270#R     *ICMAX    66530 I
*S6      66531 R        D1       66532#R    *NFALL     66570 I     *FLOW1    66571 R     *FLBTU    66572 R
 TITLE   66573#R       *ICOUNT    66617 I    *YLDCC     66620 R      GRAV     66621#R    *NSIZE    66633 I
 SIZE    66634#R        CC       66663#R    *EPSLN1    70513 R     *S5       70514 R      C2       70515#R
*FLS02   70520 R       *NFLOWS    70521 I    *EPSLN2    70522 R      BTU      70523#R      REF      70527#R
```

FLOW	72357#R	L	72413#I	*SUM2	72451 R	*NRETRT	72452 I	*I	72453 I
WT	72454#R	*NGRAV	72503 I	*S4	72504 R	C1	72505#R	*KCOUNT	72510 I
*IG	72511 I	*SUM1	72512 R						

TEMPORARIES

.80021	73366 I	.80022	73367 I	.80023	73370 I	.80024	73371 I	.80025	73372 I
.80026	73373 I	.80027	73374 I	.80010	73375 I	.80011	73376 I	.80012	73377 I
.80013	73400 I	.80014	73401 I	.80015	73402 I	.80016	73403 I	.80017	73404 I
.80000	73405 I	.80001	73406 I	.80002	73407 I	.80003	73410 I	.80004	73411 I
.80005	73412 I	.80006	73413 I	.80007	73414 I	.80030	73415 I	.80031	73416 I
.80032	73417 I	.80033	73420 I	.80034	73421 I	.80035	73422 I	.80020	73423 I
.00000	73424 1	.00001	73425 1	.00002	73426 1	.00003	73427 1	.00004	73430 1

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	-	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	-	-	-	-	-	-	-	-	-	-
00060	-	-	-	-	-	-	-	-	-	-
00070	-	-	-	-	-	-	-	-	-	-
00080	-	-	-	-	-	-	-	-	-	-
00090	-	-	-	-	-	-	-	-	-	-
00100	-	-	-	-	-	-	-	-	-	-
00110	-	-	-	-	-	-	-	-	-	-
00120	-	-	-	-	-	-	-	-	-	-
00130	-	-	-	-	-	-	-	-	-	-
00140	-	-	-	-	-	-	-	-	-	-
00150	-	-	-	-	-	-	-	-	-	-
00160	-	-	-	-	-	-	-	-	-	-
00170	-	-	-	-	-	-	-	-	-	-
00180	-	-	-	-	-	-	-	-	-	-
00190	-	-	-	-	-	-	-	-	-	-
00200	-	-	-	-	-	-	-	-	-	-
00210	-	-	-	-	-	-	-	-	-	-
00220	-	-	-	-	3	5	7	11	13	14
00230	-	-	-	16	22	24	33	35	40	43
00240	60	77	124	141	-	-	-	156	162	164
00250	166	174	175	201	203	205	226	240	245	251
00260	252	254	263	265	277	304	310	-	-	-
00270	321	325	330	333	337	343	351	360	367	377
00280	402	405	407	415	424	436	450	462	471	474
00290	476	501	505	510	512	-	-	-	514	515
00300	516	522	523	-	526	530	533	534	-	543
00310	544	547	550	554	562	564	566	570	573	577
00320	601	603	611	614	-	-	-	-	-	-
00330	617	-	-	-	-	624	625	633	635	642

```
00340 ! -      646   652   653   657   661   664   670   672   673
00350 ! -      676   704   705   711   713   716   -     721   -
00360 ! -      742   -     -     755   -     -     -     -     -
00370 ! 1001   -     -     -     1026  -     -     1053  -     -
00380 ! 1066   -     -     -     1104  1107  1113  1117  1124  1134
00390 ! 1143   1155  1167  1176  1204  -     1210  1214  1220  1221
00400 ! 1231   1242  1253  1254  1256  1262  1263  1265  1271  1272
00410 ! 1274   1300  1303  1304  1313  1317  1320  1330  1341  1342
00420 ! 1344   1350  1351  1353  1357  1362  1363  1367  1370  1374
00430 ! 1376   1405  1414  1417  -     -     -     1422  1425  1431
00440 ! 1435   1436  1442  1450  1456  1460  1462  -     -     -
00450 ! -      1472  1477  1503  1511  1521  1534  1536  1541  1550
00460 ! -      1553  1557  1562  1564  1566  1567  -     -     1572
00470 ! 1576   -     1577  1600  1604  1612  1613  1614  -     1625
00480 ! -      1637  1641  -     1656  1657  -     1660  1664  1670
00490 ! 1673   1676  1702  -     -     -     1703  1705  1710  1714
00500 ! 1715   1720  1732  1740  1751  1752  1760  1761  1767  1770
00510 ! 1776   2000  2002  2007  2015  -     -     -     2023  -
00520 ! 2025   2030  2032
```

MAIN. OCTAL PROG SIZE=76757 [SCALARS/ARRAYS=72512 + FORMATS=653 + TEMPS/CONS=56 + CODE=2034 + ARGS=1260] + COMMON=15007
[NO ERRORS DETECTED]

```
BLEND   BLEND1,F4       FORTRAN V,5A(563) /KI   6-OCT-77        12:32   PAGE 1


00001          SUBROUTINE BLEND(FEED1,FEED2,PROD,FLOW1,FLOW2,FPROD,NSIZE,NGRAV,
00002         1                   YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C THIS SUBROUTINE COMBINES TWO DISTINCT FLOW STREAMS                        *
00005    C                                                                           *
00006    C BOTH INCOMING FLOW STREAMS MUST BE EXPRESSED IN TERMS OF THE SAME         *
00007    C SIZE INCREMENTS                                                           *
00008    C ***************************************************************************
00009          DIMENSION FEED1(23,10,4),FEED2(23,10,4),PROD(23,10,4),BTU(4)      * DIM *
00010          COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),        * DIM *
00011         1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),  * DIM *
00012         2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),   * DIM *
00013         3              SPE(24),SIMP(24),SEA(24)                            * DIM *
00014          DO 4 I=1,NSIZE
00015          DO 4 J=1,NGRAV
00016          FLOW=FLOW1*FEED1(I,J,1)+FLOW2*FEED2(I,J,1)
00017          IF (FLOW.LE.1.E-6) GO TO 2
00018          DO 1 K=2,4
00019        1 PROD(I,J,K)=(FLOW1*FEED1(I,J,1)*FEED1(I,J,K)+FLOW2*FEED2(I,J,1)*
00020         1 FEED2(I,J,K))/FLOW
00021          GO TO 4
00022        2 DO 3 K=2,4
00023        3 PROD(I,J,K)=0.
00024        4 PROD(I,J,1)=FLOW/(FLOW1+FLOW2)
00025          FPROD=FLOW1+FLOW2
00026          IF (KBSG.EQ.0) RETURN
00027    C*****************************************************************
00028    C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00029    C*****************************************************************
00030          CALL SDSIZE(FEED1,SFEED,BTU,NSIZE,NGRAV)
00031          CALL SDSIZE(FEED2,SCC,BTU,NSIZE,NGRAV)
00032          CALL SDSIZE(PROD,SREF,BTU,NSIZE,NGRAV)
00033          RETURN
00034          END


COMMON BLOCKS

/BLK1/(+1430)
SFEED       +0#R        SCC         +170#R      SMID        +360#R      SREF        +550#R      SYLD        +740#R
TYLD        +770#R      EFFIC       +1020#R     BTUREC      +1050#R     ASHERR      +1100#R     SFLT        +1130#R
SINK        +1160#R     SMISPL      +1210#R     SNRGR       +1240#R     SGRAV       +1270#R     SPE         +1320#R
SIMP        +1350#R     SEA         +1400#R


SUBPROGRAMS CALLED

SDSIZE

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*K            1 I       PROD        2#R         %YLDVSL                 *FPROD        3 R       *FLOW2        4 R
*KBSG         5 I       %BTUVSL                 *J            6 I       *FLOW1        7 R       *NSIZE       10 I
 FEED2       11#R        BTU        12#R        *FLOW        13 R       *I           14 I       *NGRAV       15 I
 FEED1       16#R
```

```
BLEND   BLEND1,F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:32   PAGE 1-1


TEMPORARIES

 .S0000     17 I        .S0001     20 I        .S0002     21 I        .S0003     22 I        .A0016     23 R


LINE NUMBER/OCTAL LOCATION MAP

       ! 0       1       2       3       4       5       6       7       8       9
-------!-------------------------------------------------------------------------------
       !
00000  ! -       0       -       -       -       -       -       -       -       -
00010  ! -       -       -       -      25      31      35      51      53      54
00020  ! -      106     107     110     121     140     143       -       -       -
00030  ! 145    147     151       -     153

BLEND   OCTAL PROG SIZE=234  [ SCALARS/ARRAYS=16 + TEMPS/CONS=10 + CODE=164 + ARGS=22 ]  + COMMON=1430
[ NO ERRORS DETECTED ]
```

```
BTUPLB  MAIN1.F4        FORTRAN V.5A(563) /KI   6-OCT-77        12:28   PAGE 1

00001          FUNCTION BTUPLB(BTU,ASH)
00002
00003     C ***************************************************************************
00004     C THIS FUNCTION CALCULATES THE BTU CONTENT OF A POUND OF COAL AS A           *
00005     C LINEAR OR QUADRATIC FUNCTION OF ASH CONTENT                                *
00006     C ***************************************************************************
00007          DIMENSION BTU(4)
00008          X=100.*ASH
00009          BTUPLB=BTU(1)-BTU(2)*X+BTU(3)*X**2
00010          IF(BTUPLB.LT.BTU(4))BTUPLB=BTU(4)
00011          RETURN
00012          END

SUBPROGRAMS CALLED


SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*BTUPLB      1 R        *ASH         2 R        *X           3 R        BTU          4#R

TEMPORARIES

 .A0002      5 R         .A0003      6 R         .A0004      7 R

LINE NUMBER/OCTAL LOCATION MAP

      ! 0       1       2       3       4       5       6       7       8       9
------!-------------------------------------------------------------------------------
      !
00000 ! -       0       -       -       -       -       -       -       7       12
00010 ! 22      -       26

BTUPLB  OCTAL PROG SIZE=43  ( SCALARS/ARRAYS=4 + TEMPS/CONS=3 + CODE=34 + ARGS=0 )
( NO ERRORS DETECTED )
```

```
      SUBROUTINE CONVRT(SYMBOL,SIZE,NSIZE)
C ***********************************************************************
C THIS SUBROUTINE CONVERTS NUMERICAL SYMBOLS TO NUMERICAL QUANTITIES     *
C                                                                        *
C PRINCIPAL ARRAYS:                                                      *
C     SYMBOL(K,I) = SET OF NUMERICAL SYMBOLS                             *
C     SIZE(I)     = SET OF NUMERICAL QUANTITIES                          *
C     SMESH(I,J)  = MESH SIZE CONVERSIONS                                *
C                                                                        *
C     K1 DENOTES WHOLE NUMBER UNITS POSITION                             *
C     K2 DENOTES POSITION OF NUMERATOR IN FRACTION                       *
C     K3 DENOTES POSITION OF DENOMINATOR IN FRACTION                     *
C ***********************************************************************
      DIMENSION SYMBOL(6,23),SIZE(23),S(13),C(10),SMESH(17,2)          * DIM *
      DATA S /1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H0,1H-,1H/,1H /,    * DIM *
     1     C /1.,2.,3.,4.,5.,6.,7.,8.,9.,0./, SMESH /4.,6.,8.,10.,14.,  * DIM *
     2     20.,28.,35.,48.,65.,100.,150.,200.,270.,325.,400.,0.,       * DIM *
     3     .185,.131,.093,.065,.046,.0328,.0232,.0164,.0116,.0082,     * DIM *
     4     .0058,.0041,.0029,.0021,.0017,.0015,0./                     * DIM *
      NS=NSIZE+1
      DO 7 I=1,NS
      K1=0
      K2=0
      K3=0
      SIZE(I)=0.
C SCAN EACH SYMBOL
      DO 1 K=1,6
      IF (SYMBOL(K,I).EQ.S(11)) K1=K-1                                 * DIM *
      IF (SYMBOL(K,I).NE.S(12)) GO TO 1
      K2=K-1
      K3=K+1
    1 CONTINUE
      IF (K1.GT.0) GO TO 3
      IF (K2.GT.0) GO TO 5
C SYMBOL REPRESENTS WHOLE NUMBER - SCAN AGAIN
      DO 2 K=1,6
      KJ=7-K                                                           * DIM *
      IF (SYMBOL(KJ,I).EQ.S(13)) GO TO 2
      K1=KJ
      GO TO 3
    2 CONTINUE
C CONVERT INTEGER PART OF NUMBER
    3 KJ=K1-1
      KK=K1-2
      DO 4 J=1,10
      IF (SYMBOL(K1,I).EQ.S(J)) SIZE(I)=SIZE(I)+C(J)                   * DIM *
      IF ((KJ.GT.0).AND.(SYMBOL(KJ,I).EQ.S(J))) SIZE(I)=SIZE(I)+10.*C(J)
      IF ((KK.GT.0).AND.(SYMBOL(KK,I).EQ.S(J))) SIZE(I)=SIZE(I)+
     1 100.*C(J)
    4 CONTINUE
C CONVERT FRACTIONAL PART OF NUMBER
    5 IF (K2.EQ.0) GO TO 7
      DO 6 J=1,10
      IF (SYMBOL(K2,I).EQ.S(J)) XNUM=C(J)                              * DIM *
      IF (SYMBOL(K3,I).EQ.S(J)) XDENOM=C(J)
    6 CONTINUE
```

```
CONVRT  CONVRT.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:29   PAGE 1-1


00057         SIZE(I)=SIZE(I)+XNUM/XDENOM
00058       7 CONTINUE
00059   C CONVERT MESH TO INCHES
00060         DO 9 I=1,NSIZE
00061         IF (SIZE(I+1).LT.SIZE(I)) GO TO 9
00062         DO 8 J=1,15                                                    * DIM *
00063         IF (ABS(SIZE(I+1)-SMESH(J,1)).GT.1.E-5) GO TO 8
00064         SIZE(I+1)=SMESH(J,2)
00065         GO TO 80
00066       8 CONTINUE
00067      80 IF (I.GT.1) GO TO 9
00068         DO 81 J=1,15                                                   * DIM *
00069         IF (ABS(SIZE(I)-SMESH(J,1)).GT.1.E-5) GO TO 81
00070         SIZE(I)=SMESH(J,2)
00071         GO TO 9
00072      81 CONTINUE
00073       9 CONTINUE
00074         RETURN
00075         END


SUBPROGRAMS CALLED

ABS.

SCALARS AND ARRAYS [ "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED ]

*N8          1 I        *K1          2 I        *K           3 I        *XDENOM      4 R        SYMBOL       5#R
 SMESH       6#R         S           50#R       *XNUM       65 R        *J          66 I        *KK         67 I
*NSIZE      70 I         SIZE        71#R       *KJ         72 I        *K3         73 I        *I          74 I
 C          75#R        *K2         107 I

TEMPORARIES

 .50000     110 I        .50001      111 I        .50002     112 I        .50003     113 I        .50004     114 I
 .50005     115 I        .A0016      116 R        .50006     117 I        .50007     120 I

LINE NUMBER/OCTAL LOCATION MAP

      : 0       1       2       3       4       5       6       7       8       9
------:-------------------------------------------------------------------------------
      :
00000 : -       0       -       -       -       -       -       -       -       -
00010 : -       -       -       -       -       -       -       -       -       -
00020 : 7       12      16      17      20      21      -       23      24      36
00030 : 45      50      53      54      57      -       61      63      66      75
00040 : 76      77      -       100     103     106     107     122     141     -
00050 : 160     -       161     163     164     175     206     207     214     -
00060 : 217     223     227     231     241     245     246     247     252     254
00070 : 264     270     271     272     -       275

CONVRT  OCTAL PROG SIZE=425  [ SCALARS/ARRAYS=107 + TEMPS/CONS=16 + CODE=300 + ARGS=0 ]
[ NO ERRORS DETECTED ]
```

```
00001         SUBROUTINE CRUSH(N,SO,SIZE,NSIZE,NGRAV,FEED,PROD,FPROD,
00002        1                 YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C  THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE
00005    C  CRUSHER PRODUCT FOR A GIVEN FEED.
00006    C
00007    C
00008    C    VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST
00009    C      IPRIM          = SELECTION INDEX
00010    C                           IPRIM=1  FOR PRIMARY CRUSHER
00011    C                           IPRIM=2  FOR SECONDARY CRUSHER
00012    C      ITYPE          = TYPE OF BREAKER
00013    C                           ITYPE=1  FOR MULTIPLE ROLL CRUSHER
00014    C                           ITYPE=2  FOR GYRATORY/JAW CRUSHER
00015    C                           ITYPE=3  FOR SINGLE ROLL CRUSHER
00016    C                           ITYPE=4  FOR CAGE MILL CRUSHER
00017    C      SO             = CRUSHER SETTING
00018    C      SIZE(I)        = BOUNDARIES OF COAL SIZE INCREMENTS
00019    C      NSIZE          = NUMBER OF SIZE INCREMENTS
00020    C      NGRAV          = NUMBER OF GRAVITY INCREMENTS
00021    C      FEED(I,J,K)    = PROPERTIES OF FEED STREAM
00022    C      PROD(I,J,K)    = PROPERTIES OF PRODUCT STREAM
00023    C      FPROD          = PRODUCT FLOW RATE
00024    C      I              = DESIGNATES SIZE INCREMENT OF COAL
00025    C      J              = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL
00026    C      K              = DESIGNATES WEIGHT, ASH, PYRITIC SULPHUR AND TOTAL SULPHUR
00027    C                       (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE
00028    C                       STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)
00029    C ***************************************************************************
00030         DIMENSION BTU(4),SIZE(23),FEED(23,10,4),PROD(23,10,4)                 * DIM *
00031         DIMENSION SRATIO(13),SP(13),SS(13),SRATIO(13),B1(11),                 * DIM *
00032        1 B2(11),B3(11),B4(11),B5(11)                                          * DIM *
00033         DIMENSION BK(11,5),                                                   * DIM *
00034        2 SMID(23),B(13),BR(23,23),P(23,23),          FED(23,10,4)            * DIM *
00035         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5),             * DIM *
00036        1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),     * DIM *
00037        2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),      * DIM *
00038        3              SPE(24),SIMP(24),SEA(24)                               * DIM *
00039         DATA SRATIO/.95,.9,.8,.7,.6,.5,.4,.3,.2,.1,.05,.001,.0001/            * DIM *
00040         DATA SP/.67,.449,.2019,.0907,.0408,.0183,.0082,.0037,.0017,.0007,      * DIM *
00041        1 .0005,.0003,.0003/                                                   * DIM *
00042         DATA SS /.905,.819,.670,.549,.449,.368,.3012,.2466,.2019,.1653,        * DIM *
00043        1 .1496,.1356,.135/                                                    * DIM *
00044         DATA BRATIO /1.0,.8308,.5882,.4176,.2065,.1041,.0522,.0368,.026,       * DIM *
00045        1 .0131,3*0./                                                          * DIM *
00046         DATA B1 /1.0,.95,.85,.65,.35,.22,.14,.11,.09,.03,.0/                   * DIM *
00047         DATA B2 /1.0,.95,.85,.70,.35,.20,.19,.17,.12,.08,.0/                   * DIM *
00048         DATA B3 /1.0,.96,.79,.45,.20,.10,.05,.03,.02,.0,.0/                    * DIM *
00049         DATA B4 /1.0,.84,.50,.32,.15,.052,.019,.011,.0066,.002,.0/             * DIM *
00050         DATA B5 /1.0,.8927,.7035,.54,.2952,.1564,.0805,.0572,.0406,.0206,      * DIM *
00051        1  .0/                                                                 * DIM *
00052         DO 1 I=1,13                                                           * DIM *
00053         SP(I) =.85*SP(I)                                                      * DIM *
00054        1 SS(I)= .85*SS(I)
00055         IPRIM=1
00056         ITYPE=1
```

```
00057          IF (N.GE.16) IPRIM=2
00058          IF ((N.EQ.13).OR.(N.EQ.17)) ITYPE=2
00059          IF ((N.EQ.14).OR.(N.EQ.18)) ITYPE=3
00060          IF ((N.EQ.15).OR.(N.EQ.19)) ITYPE=4
00061          DO 2 I=1,11
00062          BK(I,1)=B1(I)                                              * DIM *
00063          BK(I,2)=B2(I)
00064          BK(I,3)=B3(I)
00065          BK(I,4)=B4(I)
00066          BK(I,5)=B5(I)
00067        2 CONTINUE
00068    C     DETERMINATION OF SIZE INTERVAL IN WHICH 1.7*SO IS LOCATED
00069          DO 10 I=1,NSIZE
00070       10 SMID(I)=(SIZE(I)+SIZE(I+1))/2.0
00071          NNS=NSIZE+1
00072          DO 3 I=1,NNS
00073          IF(SIZE(I)-1.7*SO) 4,3,3
00074        4 M1=I-1
00075          GO TO 8
00076        3 CONTINUE
00077        8 DO 21 I=1,NSIZE
00078          DO 21 J=1,NGRAV
00079          DO 21 K=1,4
00080          FED(I,J,K)=FEED(I,J,K)                                     * DIM *
00081       21 PROD(I,J,K)=0.0
00082          M=M1-1
00083          MM=M1+1
00084          IF(M1.EQ.0) GO TO 90
00085    C     BREAKAGE OF MATERIAL IN SIZE INTERVALS GREATER THAN 1.7*SO
00086          DO 15 I=1,11
00087       15 B(I)=BK(I,ITYPE)                                           * DIM *
00088          DO 19 I=1,M
00089          BR(I,I)=1.0
00090          L=I+1
00091          NS=NSIZE-1
00092          DO 9 II=L,NSIZE
00093          RATIOB=SMID(II)/SMID(I)
00094          CALL INTS(BRATIO,B,RATIOB,C,11)
00095        9 BR(I,II)=C                                                 * DIM *
00096          BR(I,NSIZE)=0.0
00097       19 CONTINUE
00098          IF(M1.EQ.1) GO TO 50
00099          DO 24 I=1,M
00100          L=I+1
00101          DO 23 II=L,M1
00102          LL=II-1
00103          P(I,II)=BR(I,LL)-BR(I,II)
00104          DO 23 J=1,NGRAV
00105          PROD(II,J,1)= FED(I,J,1)*P(I,II)
00106          DO 29 K=2,4
00107          PROD(II,J,K)=PROD(II,J,1)* FED(I,J,K)                      * DIM *
00108       29  FED(II,J,K)= FED(II,J,K)* FED(II,J,1)+PROD(II,J,K)
00109           FED(II,J,1)= FED(II,J,1)+PROD(II,J,1)
00110       23 CONTINUE
00111          DO 31 II=L,M1
00112          DO 31 J=1,NGRAV
```

```
00113          DO 31 K=2,4
00114          IF(FED(II,J,1).NE.0.0) GO TO 32                                  * DIM *
00115          FED(II,J,K)=0.0
00116          GO TO 31
00117       32 FED(II,J,K)=FED(II,J,K)/FED(II,J,1)
00118       31 CONTINUE
00119          DO 25 II=MM,NSIZE
00120          LL=II-1
00121          P(I,II)=BR(I,LL)-BR(I,II)
00122          DO 25 J=1,NGRAV
00123          PROD(II,J,1)=  FED(I,J,1)*P(I,II)+PROD(II,J,1)
00124          DO 27 K=2,4
00125       27 PROD(II,J,K)= FED(I,J,1) *P(I,II)* FED(I,J,K)+PROD(II,J,K)       * DIM *
00126       25 CONTINUE
00127       24 CONTINUE
00128    C     BREAKAGE OF MATERIAL IN 1.7*SO SIZE INTERVAL
00129       50 BR(M1,M1)=1.0
00130          FRAC1=(SIZE(M1)-1.7*SO)/(SIZE(M1)-SIZE(MM))
00131          FRAC2=1.0-FRAC1
00132          SMID1=(SIZE(M1)+1.7*SO)/2.0
00133          SMID2=(1.7*SO+SIZE(MM))/2.0
00134          DO 66 II=MM,NSIZE
00135          RATIOB=SMID(II)/SMID1
00136          CALL INTS(BRATIO,B,RATIOB,C,11)
00137       66 BR(M1,II)=C                                                      * DIM *
00138          BR(M1,NSIZE)=0.0
00139          DO 26 II=MM,NSIZE
00140          LL=II-1
00141          P(M1,II)=BR(M1,LL)-BR(M1,II)
00142          DO 26 J=1,NGRAV
00143          PROD(II,J,1)=  FED(M1,J,1)*P(M1,II)*FRAC1+PROD(II,J,1)
00144          DO 28 K=2,4
00145       28 PROD(II,J,K)=  FED(M1,J,1)*P(M1,II)* FED(M1,J,K)*FRAC1+          * DIM *
00146         1 PROD(II,J,K)
00147       26 CONTINUE
00148          DO 42 I=1,11
00149       42 B(I)=BK(I,5)                                                     * DIM *
00150          DO 61 II=MM,NSIZE
00151          RATIOB=SMID(II)/SMID2
00152          CALL INTS(BRATIO,B,RATIOB,C,11)
00153       61 BR(M1,II)=C                                                      * DIM *
00154          BR(M1,NSIZE)=0.0
00155          SEL=.65
00156          BR(M1,M1)=SEL
00157          DO 62 II=MM,NSIZE
00158          BR(M1,II)=BR(M1,II)*SEL
00159          LL=II-1
00160          P(M1,II)=BR(M1,LL)-BR(M1,II)
00161          DO 62 J=1,NGRAV
00162          PROD(II,J,1)=  FED(M1,J,1)*P(M1,II)*FRAC2+PROD(II,J,1)
00163          DO 63 K=2,4
00164       63 PROD(II,J,K)=  FED(M1,J,1)*P(M1,II)* FED(M1,J,K)*FRAC2+          * DIM *
00165         1 PROD(II,J,K)
00166       62 CONTINUE
00167          DO 64 J=1,NGRAV
00168          PROD(M1,J,1)= FED(M1,J,1)*FRAC2*(1.0-SEL)
```

```
00169          DO 64 K=2,4                                                    * DIM *
00170       64 PROD(M1,J,K)=PROD(M1,J,1)* FED(M1,J,K)
00171          DO 60 I=1,M
00172          DO 60 J=1,NGRAV
00173          DO 60 K=1,4                                                    * DIM *
00174       60 PROD(I,J,K)=0.0
00175    C     BREAKAGE OF MATERIAL IN SIZE INTERVALS LESS THAN 1.7*SO
00176       90 DO 49 I=MM,NS
00177          L=I+1
00178          DO 43 II=L,NSIZE
00179          RATIOB=SMID(II)/SMID(I)
00180          CALL INTS(SRATIO,B,RATIOB,C,11)                                * DIM *
00181       43 BR(I,II)=C
00182          BR(I,NSIZE)=0.0
00183          BR(NSIZE,NSIZE)=0.0
00184          SEL1=0.0
00185          SEL2=0.0
00186          FRAC1=1.0
00187          FRAC2=1.0
00188          IF(SIZE(I)-SO)44,44,45
00189       45 SEL1=.85
00190          IF(SIZE(I+1)-SO)76,46,46
00191       76 FRAC1=(SIZE(I)-SO)/(SIZE(I)-SIZE(I+1))
00192          FRAC2=1.0-FRAC1
00193          SMID2=(SO+SIZE(I+1))/2.0
00194          RATIOS=SMID2/SO
00195          GO TO 74
00196       44 RATIOS=SMID(I)/SO
00197       74 IF(IPRIM.EQ.2) GO TO 48
00198          CALL INTS(SRATIO,SP,RATIOS,SEL2,13)                            * DIM *
00199          GO TO 46
00200       48 CALL INTS(SRATIO,SS,RATIOS,SEL2,13)                            * DIM *
00201       46 DO 47 II=L,NSIZE
00202          SEL=SEL1*FRAC1+SEL2*FRAC2
00203       47 BR(I,II)=BR(I,II)*SEL
00204          BR(I,I)=SEL
00205       49 CONTINUE
00206          DO 54 I=MM,NS
00207          L=I+1
00208          DO 54 II=L,NSIZE
00209          LL=II-1
00210          P(I,II)=BR(I,LL)-BR(I,II)
00211          DO 54 J=1,NGRAV
00212          PROD(II,J,1)=  FED(I,J,1)*P(I,II)+PROD(II,J,1)
00213          DO 57 K=2,4                                                    * DIM *
00214       57 PROD(II,J,K)= FED(I,J,1) *P(I,II)* FED(I,J,K)+PROD(II,J,K)
00215       54 CONTINUE
00216          DO 40 II=MM,NSIZE
00217          DO 40 J=1,NGRAV
00218          PROD(II,J,1)=PROD(II,J,1)+ FED(II,J,1)*(1.0-BR(II,II))
00219          DO 40 K=2,4                                                    * DIM *
00220       40 PROD(II,J,K)=PROD(II,J,K)+ FED(II,J,K)* FED(II,J,1)*(1.0-BR(II,II)
00221         1 )
00222          DO 41 II=M1,NSIZE
00223          DO 41 J=1,NGRAV
00224          DO 41 K=2,4                                                    * DIM *
```

```
CRUSH   CRUSH1.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:31   PAGE 1-4

00225          IF(PROD(II,J,1).NE.0.0) GO TO 78
00226          PROD(II,J,K)=0.0
00227          GO TO 41
00228       78 PROD(II,J,K)=PROD(II,J,K)/PROD(II,J,1)
00229       41 CONTINUE
00230          FPROD=0.0
00231          DO 77 I=1,NSIZE
00232          DO 77 J=1,NGRAV
00233       77 FPROD=FPROD+PROD(I,J,1)
00234    C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAM
00235          DO 79 I=1,NSIZE
00236          DO 79 J=1,NGRAV
00237       79 PROD(I,J,1)=PROD(I,J,1)/FPROD
00238          IF (KBSG.EQ.0) RETURN
00239    C*****************************************************************************
00240    C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00241    C*****************************************************************************
00242          CALL SDSIZE(FEED,$FEED,BTU,NSIZE,NGRAV)
00243          CALL SDSIZE(PROD,SCC,BTU,NSIZE,NGRAV)
00244           RETURN
00245          END


COMMON BLOCKS

/BLK1/(+1430)
$FEED      +0#R      SCC       +170#R    $MD       +360#R    $REF      +550#R    $YLD      +740#R
TYLD       +770#R    EFFIC     +1020#R   BTUREC    +1050#R   ASHERR    +1100#R   $FLT      +1130#R
$INK       +1160#R   $MISPL    +1210#R   $NRGR     +1240#R   $GRAV     +1270#R   $PE       +1320#R
$IMP       +1350#R   $EA       +1400#R


SUBPROGRAMS CALLED

INTS    SDSIZE

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED )

*LL          1 I     B2          2#R     *NS         15 I     *SO         16 R     *$EL        17 R
*N          20 I     FEED       21#R     *K          22 I     *$MID1      23 R     *NNS        24 I
*ITYPE      25 I     PROD       26#R     R1          27#R     $          42#R     XYLDVSL
*FPROD      57 R     FED        60#R     RR        1710#R     *$EL2     2731 R     $$        2732#R
 $MID     2747#R    *KRSG    2776 I     P         2777#R     XBTUVSL                *FRAC2    4020 R
*M1        4021 I    *M       4022 I     BRATIO    4023#R     *IPRIM    4040 I     *MM       4041 I
*J         4042 I     B5      4043#R     *SEL1     4056 R     *II       4057 I     BK        4060#R
*FRAC1     4147 R    $RATIO   4150#R     *RATIOB   4165 R     *NSIZE    4166 I     B4        4167#R
 $IZE      4202#R    BTU      4203#R     *L        4204 I     *I        4205 I     B3        4206#R
*NGRAV     4221 I    *RATIOS  4222 R     *C        4223 R      SP       4224#R     *$MID2    4241 R


TEMPORARIES

.$0021   4242 I    .$0022   4243 I    .$0023   4244 I    .$0024   4245 I    .$0025   4246 I
.$0026   4247 I    .$0027   4250 I    .$0010   4251 I    .$0011   4252 I    .$0012   4253 I
```

```
.B0013  4254 I    .B0060  4255 I    .B0014  4256 I    .B0061  4257 I    .B0015  4260 I
.B0062  4261 I    .B0016  4262 I    .B0017  4263 I    .B0000  4264 I    .B0001  4265 I
.B0002  4266 I    .B0003  4267 I    .B0050  4270 I    .B0004  4271 I    .B0051  4272 I
.B0005  4273 I    .A0016  4274 R    .B0052  4275 I    .B0006  4276 I    .B0053  4277 I
.B0007  4300 I    .B0054  4301 I    .B0055  4302 I    .B0056  4303 I    .B0057  4304 I
.B0040  4305 I    .B0041  4306 I    .B0042  4307 I    .B0043  4310 I    .B0044  4311 I
.B0045  4312 I    .B0046  4313 I    .B0047  4314 I    .B0030  4315 I    .B0031  4316 I
.B0032  4317 I    .B0033  4320 I    .B0034  4321 I    .B0035  4322 I    .B0036  4323 I
.B0037  4324 I    .B0020  4325 I
```

LINE NUMBER/OCTAL LOCATION MAP

```
      ! 0     1     2     3     4     5     6     7     8     9
------!-------------------------------------------------------------------
      !
00000 ! -     0     -     -     -     -     -     -     -     -
00010 ! -     -     -     -     -     -     -     -     -     -
00020 ! -     -     -     -     -     -     -     -     -     -
00030 ! -     -     -     -     -     -     -     -     -     -
00040 ! -     -     -     -     -     -     -     -     -     -
00050 ! -     -     25    26    30    32    34    35    42    50
00060 ! 56    64    65    67    71    73    75    77    -     100
00070 ! 102   112   115   120   126   131   132   134   140   144
00080 ! 145   157   176   201   204   -     206   207   215   221
00090 ! 225   230   233   241   245   247   257   263   266   271
00100 ! 275   277   305   307   317   323   337   340   361   376
00110 ! 405   413   421   425   426   433   442   443   454   463
00120 ! 471   473   503   507   523   524   550   556   -     561
00130 ! 566   601   603   612   621   627   632   634   644   650
00140 ! 656   660   670   674   711   712   -     737   745   746
00150 ! 751   757   762   764   774   1000  1002  1006  1014  1020
00160 ! 1023  1033  1037  1054  1055  -     1102  1110  1114  1126
00170 ! 1127  1150  1154  1160  1161  -     1200  1206  1210  1216
00180 ! 1222  1224  1234  1240  1244  1245  1246  1250  1251  1256
00190 ! 1260  1265  1275  1300  1306  1310  1311  1315  1320  1322
00200 ! 1323  1325  1331  1337  1345  1352  1355  1363  1365  1373
00210 ! 1375  1405  1411  1425  1426  1452  1463  1471  1475  1510
00220 ! 1511  -     1541  1547  1553  1554  1562  1572  1573  1607
00230 ! 1616  1617  1623  1625  -     1640  1644  1646  1662  -
00240 ! -     -     1664  1666  -     1670
```

CRUSH OCTAL PROG SIZE=6320 [SCALARS/ARRAYS=4241 + TEMPS/CONS=76 + CODE=1701 + ARGS=60] + COMMON=1430
[NO ERRORS DETECTED]

```
EXPAND  EXPAND.F4       FORTRAN V.5A(563) /KI   12-OCT-77       17:05   PAGE 1


00001          SUBROUTINE EXPAND(X,Y,N,NSIZE,NGRAV)
00002    C ***************************************************************************
00003    C THIS SUBROUTINE EXPANDS THE DIMENSIONALITY OF A 1-DIMENSIONAL ARRAY TO       &
00004    C A 3-DIMENSIONAL ARRAY                                                        *
00005    C ***************************************************************************
00006          DIMENSION X(920,28),Y(23,10,4)                                  * DIM *
00007          DO 1 I=1,NSIZE
00008          DO 1 J=1,NGRAV
00009          DO 1 K=1,4                                                      * DIM *
00010          IJK=40*(I-1)+4*(J-1)+K                                          * DIM *
00011          Y(I,J,K)=X(IJK,N)
00012          IF ((K.EQ.1).AND.(Y(I,J,K).EQ.0.)) Y(I,J,K)=1.E-6
00013        1 CONTINUE
00014          RETURN
00015          END

SUBPROGRAMS CALLED


SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*N          1 I         *K          2 I         *IJK        3 I          Y          4#R         *J          5 I
*NSIZE      6 I          X          7#R         *I         10 I         *NGRAV     11 I

TEMPORARIES

 .80000    12 I          .80001    13 I          .80002    14 I

LINE NUMBER/OCTAL LOCATION MAP

      ! 0       1       2       3       4       5       6       7       8       9
------!-------------------------------------------------------------------------------
      !
00000 ! -       0       -       -       -       -       -      12      16      22
00010 ! 23      34      51      76      -      105

EXPAND  OCTAL PROG SIZE=126  ( SCALARS/ARRAYS=11 + TEMPS/CONS=6 + CODE=107 + ARGS=0 )
[ NO ERRORS DETECTED ]
```

```
00001         SUBROUTINE FROTH(FEED,CC,REF,SIZE,GRAV,GBOUND,YLDCC,YLDREF,
00002        1 NSIZE,NGRAV,NCOMP,YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C THIS SUBROUTINE DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF      *
00005    C THE CLEAN COAL (FLOAT) AND REFUSE (TAILS) FROM A FROTH FLOTATION CELL      *
00006    C                                                                            *
00007    C THE CALCULATIONS ARE BASED UPON THE "YIELD AT 1.50, ASH AT 1.60" RULE      *
00008    C (WITH RESPECT TO THE FEED STREAM)                                          *
00009    C                                                                            *
00010    C A FICTITIOUS DISTRIBUTION CURVE IS THEN FITTED TO THE OVERALL SEPARATION   *
00011    C IN ORDER TO CALCULATE THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE       *
00012    C PRODUCT STREAMS AS A FUNCTION OF SPECIFIC GRAVITY                          *
00013    C ***************************************************************************
00014         DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),SIZE(23),BTU(4), * DIM *
00015        1   GRAV(10),GBOUND(11)                                             * DIM *
00016         DIMENSION GRAVTY(20)                                               * DIM *
00017         COMMON    SCMWT(20),SCMASH(20),YLDPTS(20),ASHPTS(20),               * DIM *
00018        1            S(20),DELTA(10),YIELD(23),ASH(23)                     * DIM *
00019         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),         * DIM *
00020        1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),  * DIM *
00021        2              SFLT(24),SINK(24),SMIDPL(24),SNRGR(24),SGRAV(24),   * DIM *
00022        3              SPE(24),SIMP(24),SEA(24)                            * DIM *
00023         COMMON /BLK2/ DISTRB(24,10)                                        * DIM *
00024         DATA GRAVTY /20*0./                                                * DIM *
00025         NS=NSIZE+1
00026         NG=NGRAV+1
00027         DO 1 J=1,NG
00028        1 GRAVTY(J)=GBOUND(J)
00029    C ***************************************************************************
00030    C DETERMINE OVERALL YIELD AND OVERALL ASH CONTENT IN FLOAT FOR EACH          *
00031    C SIZE INCREMENT                                                             *
00032    C ***************************************************************************
00033         DO 2 I=1,NSIZE
00034         SFEED(I,1)=0.
00035         DO 2 J=1,NGRAV
00036        2 SFEED(I,1)=SFEED(I,1)+100.*FEED(I,J,1)
00037         DO 5 I=1,NSIZE
00038         SCMWT(1)=0.
00039         SCMASH(1)=0.
00040         DO 4 J=2,NG
00041         J1=J-1
00042         SCMWT(J)=0.
00043         SCMASH(J)=0.
00044         DO 3 K=1,J1
00045         SCMWT(J)=SCMWT(J)+1.E+4*FEED(I,K,1)/SFEED(I,1)
00046        3 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00047         SCMASH(J)=1.E+4*SCMASH(J)/(SCMWT(J)*SFEED(I,1))
00048         IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00049        4 CONTINUE
00050         YIELD(I)=.01*YINTRP(GRAVTY,SCMWT,1.50,NG)
00051         ASH(I)=.01*YINTRP(GRAVTY,SCMASH,1.60,NG)
00052        5 CONTINUE
00053         STOT1=0.
00054         STOT2=0.
00055    C ***************************************************************************
00056    C FIT DISTRIBUTION DATA TO OVERALL SEPARATION FOR EACH SIZE INCREMENT         *
```

```
00057   C ***************************************************************************
00058         DO 10 I=1,NSIZE
00059         IJ=0
00060         DMIN=1.E+38
00061         DO 8 I1=1,7
00062         J1=I1
00063   C CARRY OUT SEPARATION USING SEVERAL DISTRIBUTION CURVES (TABLES DATA)
00064   C AND 20 VALUES OF SGSP FOR EACH DISTRIBUTION CURVE
00065         DO 7 INDEX=1,20                                              * DIM *
00066         SUM1=0.
00067         SUM2=0.
00068         SUM3=0.
00069         S(INDEX)=1.40+.01*INDEX
00070         DO 6 J=1,NGRAV
00071         X=GRAV(J)/S(INDEX)
00072         CC(I,J,1)=Y(X,1,J1)*FEED(I,J,1)
00073         REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)
00074         CC(I,J,2)=FEED(I,J,2)
00075         REF(I,J,2)=FEED(I,J,2)
00076         SUM1=SUM1+FEED(I,J,1)
00077         SUM2=SUM2+CC(I,J,1)
00078         SUM3=SUM3+CC(I,J,1)*CC(I,J,2)
00079       6 CONTINUE
00080   C CALCULATE YIELD AND ASH CONTENT FOR EACH SEPARATION GRAVITY
00081         YLDPTS(INDEX)=SUM2/SUM1
00082         ASHPTS(INDEX)=SUM3/SUM2
00083         IF ((INDEX.GT.1).AND.(ASHPTS(INDEX).LT.ASHPTS(INDEX-1)))
00084        1 ASHPTS(INDEX)=ASHPTS(INDEX-1)
00085       7 CONTINUE
00086         IF ((YLDPTS(1).GT.YIELD(I)).OR.(YLDPTS(20).LT.YIELD(I))) GO TO 8
00087         IF ((ASHPTS(1).GT.ASH(I)).OR.(ASHPTS(20).LT.ASH(I))) GO TO 8
00088   C DETERMINE DISTRIBUTION CURVE AND SEPARATION GRAVITY THAT BEST MATCH
00089   C OVERALL YIELD AND OVERALL ASH CALCULATIONS
00090         SGSP1=YINTRP(YLDPTS,S,YIELD(I),20)                           * DIM *
00091         SGSP2=YINTRP(ASHPTS,S,ASH(I),20)                             * DIM *
00092         IF (ASHPTS(20)-ASHPTS(1).LE.0.00001) SGSP2=SGSP1
00093         SGAV=.5*(SGSP1+SGSP2)
00094         DIFF=ABS(SGSP2-SGSP1)
00095         IF (DIFF.GE.DMIN) GO TO 8
00096         IJ=I1
00097         SGSP=SGAV
00098         DMIN=DIFF
00099       8 CONTINUE
00100   C RECALCULATE SEPARATION USING BEST DISTRIBUTION CURVE (IJ) AND BEST
00101   C VALUE FOR SPECIFIC GRAVITY OF SEPARATION (SGSP)
00102         SUM1=0.
00103         SUM2=0.
00104         SUM3=0.
00105         SUM4=0.
00106         DO 9 J=1,NGRAV
00107         CC(I,J,1)=YIELD(I)*FEED(I,J,1)
00108         IF (IJ.EQ.0) GO TO 80
00109         X=GRAV(J)/SGSP
00110         CC(I,J,1)=Y(X,1,IJ)*FEED(I,J,1)
00111      80 REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)
00112         SUM1=SUM1+FEED(I,J,1)
```

```
00113          SUM2=SUM2+CC(I,J,1)
00114          SUM3=SUM3+CC(I,J,1)*FEED(I,J,2)
00115          SUM4=SUM4+REF(I,J,1)
00116          DO 9 K=2,4                                              * DIM *
00117          CC(I,J,K)=FEED(I,J,K)
00118          REF(I,J,K)=FEED(I,J,K)
00119        9 CONTINUE
00120          XYLD=SUM2/SUM1
00121          XASH=SUM3/SUM2
00122    C ****** BEGIN FIX (MODIFICATION OF DISTRIBUTION DATA) ******
00123          IF (IJ.EQ.0) GO TO 92
00124          IF (ABS(YIELD(I)-XYLD).LE.1.E-4) GO TO 92
00125          YLDAV=.5*(YIELD(I)+XYLD)
00126          ASHAV=.5*(ASH(I)+XASH)
00127          TARGET=YLDAV*(ASH(I)-XASH)/(YIELD(I)-XYLD)
00128          DMIN=1.E+38
00129    C DETERMINE SPECIFIC GRAVITY INCREMENT FOR WHICH (ASH(J)-OVERALL ASH)
00130    C APPROACHES TARGET VALUE MOST CLOSELY
00131          DO 90 J=1,NGRAV
00132          DELTA(J)=0.
00133          ASHDIF=CC(I,J,2)-ASHAV
00134          DIFF=ABS(TARGET-ASHDIF)
00135          IF (DIFF.GE.DMIN) GO TO 90
00136          JK=J
00137          DMIN=DIFF
00138       90 CONTINUE
00139    C MODIFY DISTRIBUTION DATA IN SPECIFIC GRAVITY INCREMENT JK AND
00140    C RECALCULATE SEPARATION
00141          DELTA(JK)=(YIELD(I)-XYLD)/FEED(I,JK,1)
00142          SUM1=0.
00143          SUM2=0.
00144          SUM3=0.
00145          SUM4=0.
00146          DO 91 J=1,NGRAV
00147          X=GRAV(J)/SGSP
00148          F=Y(X,1,IJ)+DELTA(J)
00149          IF (F.GT.1.) F=1.
00150          IF (F.LT.0.) F=0.
00151          CC(I,J,1)=F*FEED(I,J,1)
00152          REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)
00153          SUM1=SUM1+FEED(I,J,1)
00154          SUM2=SUM2+CC(I,J,1)
00155          SUM3=SUM3+CC(I,J,1)*CC(I,J,2)
00156       91 SUM4=SUM4+REF(I,J,1)
00157          XYLD=SUM2/SUM1
00158          XASH=SUM3/SUM2
00159       92 CONTINUE
00160    C ****** END FIX ******
00161          STOT1=STOT1+SUM2
00162          STOT2=STOT2+SUM4
00163       10 CONTINUE
00164          YLDCC=STOT1
00165          YLDREF=STOT2
00166    C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00167          DO 11 I=1,NSIZE
00168          DO 11 J=1,NGRAV
```

```
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00169           CC(I,J,1)=CC(I,J,1)/STOT1
00170        11 REF(I,J,1)=REF(I,J,1)/STOT2
00171      C ***************************************************************************************
00172      C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00173      C ***************************************************************************************
00174           CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00175           CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00176           CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00177           DO 17 I=1,NSIZE
00178           SYLD(I)=100.*STOT1*SCC(I,1)/SFEED(I,1)
00179        17 BTUREC(I)=100.*YLDCC*SCC(I,1)*SCC(I,5)/(SFEED(I,1)*SFEED(I,5))
00180           SYLD(NS)=100.*YLDCC
00181           BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5)
00182          1)
00183           YLDVSL=SYLD(NS)
00184           BTUVSL=BTUREC(NS)
00185           RETURN
00186           END

COMMON BLOCKS

/,COMM,/(+234)
SCMNT       +0#R        SCHASH      +24#R       YLDPTS      +50#R       ASHPTS      +74#R       S           +120#R
DELTA       +144#R      YIELD       +156#R      ASH         +205#R

/BLK1/(+1430)
SFEED       +0#R        SCC         +170#R      SMID        +360#R
SREF        +550#R      SYLD        +740#R      TYLD        +770#R      EFFIC       +1020#R     BTUREC      +1050#R
ASHERR      +1100#R     SFLT        +1130#R     SINK        +1160#R     SMISPL      +1210#R     SNRGR       +1240#R
SGRAV       +1270#R     SPE         +1320#R     SIMP        +1350#R     SEA         +1400#R

/BLK2/(+360)
DISTRB      +0#R

SUBPROGRAMS CALLED

YINTRP  Y       SDSIZE  ABS.

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*XASH       1 R     *SGSP2      2 R     *DMIN       3 R     %NCOMP                  *DIFF       4 R
*NS         5 I      FEED       6#R      *K          7 I     *STOT1      10 R        *SGSP1      11 R
*NG        12 I      GBOUND     13#R     *YLDVSL    14 R     *YLDAV      15 R        *XYLD       16 R
*IJ        17 I     *ASHAV      20 R     %KBSG               *SGSP       21 R        *BTUVSL     22 R
*INDEX     23 I     *YLDREF     24 R     *J1         25 I    *SGAV       26 R        *J          27 I
 GRAVTY    30#R     *SUM4       54 R     *YLDCC      55 R     GRAV       56#R        *SUM3       57 R
*NSIZE     60 I     %SIZE                CC         61#R     *X          62 R         BTU        63#R
 REF       64#R     *SUM2       65 R     *I1         66 I    *I          67 I        *F          70 R
*TARGET    71 R     *JK         72 I     *NGRAV      73 I    *ASHDIF     74 R        *SUM1       75 R
*STOT2     76 R
```

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TEMPORARIES

 .$0010     77 I        .$0011    100 I        .$0012    101 I        .$0013    102 I        .$0014    103 I
 .$0015    104 I        .$0016    105 I        .$0017    106 I        .$0000    107 I        .$0001    110 I
 .$0002    111 I        .$0003    112 I        .$0004    113 I        .$0005    114 I        .A0016    115 R
 .$0006    116 I        .$0007    117 I        .$0020    120 I        .00000    121 I


LINE NUMBER/OCTAL LOCATION MAP

      I 0       1       2       3       4       5       6       7       8       9
------I-------------------------------------------------------------------------------
      I
00000 I -       0       -       -       -       -       -       -       -       -
00010 I -       -       -       -       -       -       -       -       -       -
00020 I -       -       -       -       -       33      36      41      43      -
00030 I -       -       -       51      55      56      60      75      101     102
00040 I 103     110     112     114     115     117     131     143     152     156
00050 I 161     166     172     175     176     -       -       -       177     203
00060 I 204     206     212     -       -       213     217     220     221     222
00070 I 226     230     236     251     265     276     307     315     323     332
00080 I -       334     340     343     -       352     355     364     -       -
00090 I 372     377     405     413     417     423     425     427     430     431
00100 I -       -       434     435     436     437     440     444     456     460
00110 I 465     500     514     522     530     542     550     551     565     601
00120 I 605     610     -       613     615     623     626     631     640     -
00130 I -       642     644     645     654     660     662     663     664     -
00140 I -       666     700     701     702     703     704     706     713     717
00150 I 723     725     737     753     761     767     776     1006    1011    -
00160 I -       1014    1016    1020    1023    1025    -       1027    1033    1035
00170 I 1044    -       -       -       1060    1062    1064    1066    1070    1075
00180 I 1107    1113    -       1123    1125    -       1127

FROTH   OCTAL PROG SIZE=1367  [ SCALARS/ARRAYS=76 + TEMPS/CONS=41 + CODE=1146 + ARGS=62 ]  + COMMON=2244
[ NO ERRORS DETECTED ]
```

```
INTS    INTS.F4 FORTRAN V.5A(563) /KI   6-OCT-77        12:29   PAGE 1

00001          SUBROUTINE INTS(X,Y,RX,RY,N)
00002     C ***************************************************************************
00003     C      LINEAR INTERPOLATION / EXTRAPOLATION ROUTINE                          *
00004     C                                                                            *
00005     C      CALLED BY SUBROUTINES CRUSH, ROTARY AND SCREEN                        *
00006     C ***************************************************************************
00007          DIMENSION X(13),Y(13)
00008          IF(X(2)-X(1)) 3,3,4                                          * DIM *
00009        3 DO 5 J=2,N
00010          K=J
00011          IF(RX-X(J)) 5,2,2
00012        5 CONTINUE
00013          GO TO 2
00014        4 DO 1 J=2,N
00015          K=J
00016          IF(RX-X(J)) 2,2,1
00017        1 CONTINUE
00018        2 J=K
00019          RY=((Y(J-1)-Y(J))*(X(J)-RX)/(X(J)-X(J-1)))+Y(J)
00020          RETURN
00021          END

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED ]

*N            1 I         *K            2 I         Y             3#R         *J            4 I         *RY           5 R
 X            6#R         *RX           7 R

TEMPORARIES

 .S0000      10 I          .S0001      11 I

LINE NUMBER/OCTAL LOCATION MAP

      ! 0       1       2       3       4       5       6       7       8       9
------!-------------------------------------------------------------------------------
      !
00000 ! -       0       -       -       -       -       -       -      12      16
00010 ! 22      24      30      32      33      37      41      45      47      51
00020 ! -       66

INTS    OCTAL PROG SIZE=104   [ SCALARS/ARRAYS=7 + TEMPS/CONS=3 + CODE=72 + ARGS=0 ]
[ NO ERRORS DETECTED ]
```

```
00001          SUBROUTINE OUTPT1(FEED,SYMBOL,GBOUND,BTU,FLBTU,FLSO2,NSIZE,NGRAV,
00002         1 NCOMP)
00003    C ***************************************************************************************
00004    C THIS SUBROUTINE PRINTS THE SPECIFIC GRAVITY ANALYSIS OF A SPECIFIED                    *
00005    C FLOW STREAM                                                                            *
00006    C ***************************************************************************************
00007          DIMENSION FEED(23,10,4),SYMBOL(6,23),GBOUND(11),PERCNT(23),WT(10),* DIM *
00008         1 BTU(4),XBTU(10)                                                  * DIM *
00009          COMMON /SYS/ G,H
00010          INTEGER G,H
00011          DATA BLANK /1H /
00012      500 FORMAT(1H0,45X,8HSPECIFIC,12X,15HDIRECT, PERCENT,21X,19HCUMULATIVE
00013         1, PERCENT/,8X,24HSIZE FRACTION AND WEIGHT,14X,7HGRAVITY,
00014         2 2(4X,34HWEIGHT ASH  PYRITIC TOTAL  BTU/LB )/,
00015         3 54X,2(15X,15HSULFUR  SULFUR ,8X))
00016      501 FORMAT(1H0,2X,6A1,4H BY ,6A1,11X,F5.1,16H PERCENT  FLOAT ,F4.2,2X,
00017         1 F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,5X,F5.1,1X,F5.1,2X,F5.2,
00018         2 2X,F5.2,2X,F6.0)
00019      502 FORMAT(46X,F4.2,1H-,F4.2,2X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,
00020         1 5X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0)
00021      503 FORMAT(46X,5HSINK ,F4.2,2X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,
00022         1 5X,F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0)
00023      504 FORMAT(1H0,5X,9HCOMPOSITE,15X,F5.1,16H PERCENT  FLOAT ,F4.2,2X,
00024         1 F5.1,1X,F5.1,2X,F5.2,2X,F5.2,2X,F6.0,5X,F5.1,1X,F5.1,2X,F5.2,
00025         2 2X,F5.2,2X,F6.0)
00026    C ***************************************************************************************
00027    C WRITE OUTPUT FOR EACH SIZE INCREMENT                                                   *
00028    C ***************************************************************************************
00029          WRITE (H,500)
00030          DO 5 I=1,NSIZE
00031    C CALCULATE WEIGHT DISTRIBUTION IN EACH SPECIFIC GRAVITY INCREMENT
00032          PERCNT(I)=0.
00033          DO 1 J=1,NGRAV
00034        1 PERCNT(I)=PERCNT(I)+FEED(I,J,1)
00035          IF (NCOMP.NE.0) GO TO 50
00036          IF (PERCNT(I).LE.0.000499) GO TO 5
00037          DO 2 J=1,NGRAV
00038          WT(J)=100.*FEED(I,J,1)/PERCNT(I)
00039        2 CONTINUE
00040    C CALCULATE CUMULATIVE WEIGHT, ASH, PYRITIC SULFUR, TOTAL SULFUR AND
00041    C BTU CONTENT
00042          CUMWT=WT(1)
00043          CUMASH=0.
00044          CUMPS=0.
00045          CUMTS=0.
00046          CUMBTU=0.
00047          ASH=100.*FEED(I,1,2)
00048          SUMASH=FEED(I,1,2)*WT(1)
00049          PS=100.*FEED(I,1,3)
00050          SUMPS=FEED(I,1,3)*WT(1)
00051          TS=100.*FEED(I,1,4)
00052          SUMTS=FEED(I,1,4)*WT(1)
00053          SUMBTU=BTUPLB(BTU,FEED(I,1,2))*WT(1)
00054          PERCNT(I)=100.*PERCNT(I)
00055          DO 23 K=1,6                                                        * DIM *
00056          IF (SYMBOL(6,I).NE.BLANK) GO TO 21
```

```
00057          DO 20 KJ=1,5
00058          KI=7-KJ                                                    * DIM *
00059       20 SYMBOL(KI,I)=SYMBOL(KI-1,I)
00060          SYMBOL(1,I)=BLANK
00061       21 IF (SYMBOL(1,I+1).NE.BLANK) GO TO 23
00062          DO 22 KJ=1,5
00063       22 SYMBOL(KJ,I+1)=SYMBOL(KJ+1,I+1)                            * DIM *
00064          SYMBOL(6,I+1)=BLANK
00065       23 CONTINUE
00066          IF (WT(1).EQ.0.) GO TO 24
00067          CUMASH=ASH
00068          CUMPS=PS
00069          CUMTS=TS
00070          XBTU(1)=BTUPLB(BTU,FEED(I,1,2))
00071    C     IF (XBTU(1).LT.0.) XBTU(1)=0.
00072          CUMBTU=XBTU(1)
00073       24 WRITE (H,501) (SYMBOL(K,I),K=1,6),(SYMBOL(K,I+1),K=1,6),    * DIM *
00074         1 PERCNT(I),GBOUND(2),WT(1),ASH,PS,TS,XBTU(1),WT(1),CUMASH,CUMPS,
00075         2 CUMTS,CUMBTU
00076          DO 4 J=2,NGRAV
00077          CUMWT=CUMWT+WT(J)
00078          SUMASH=SUMASH+FEED(I,J,2)*WT(J)
00079          ASH=100.*FEED(I,J,2)
00080          SUMPS=SUMPS+FEED(I,J,3)*WT(J)
00081          PS=100.*FEED(I,J,3)
00082          SUMTS=SUMTS+FEED(I,J,4)*WT(J)
00083          TS=100.*FEED(I,J,4)
00084          XBTU(J)=BTUPLB(BTU,FEED(I,J,2))
00085    C     IF (XBTU(J).LT.0.) XBTU(J)=0.
00086          SUMBTU=SUMBTU+XBTU(J)*WT(J)
00087          IF (CUMWT.EQ.0.) GO TO 25
00088          CUMASH=100.*SUMASH/CUMWT
00089          CUMPS=100.*SUMPS/CUMWT
00090          CUMTS=100.*SUMTS/CUMWT
00091          CUMBTU=SUMBTU/CUMWT
00092       25 IF (J.EQ.NGRAV) GO TO 3
00093          WRITE (H,502) GBOUND(J),GBOUND(J+1),WT(J),ASH,PS,TS,XBTU(J),CUMWT,
00094         1 CUMASH,CUMPS,CUMTS,CUMBTU
00095          GO TO 4
00096       3 WRITE (H,503) GBOUND(J),WT(J),ASH,PS,TS,XBTU(J),CUMWT,CUMASH,
00097         1 CUMPS,CUMTS,CUMBTU
00098       4 CONTINUE
00099       5 CONTINUE
00100          IF (NSIZE.EQ.1) RETURN
00101    C *****************************************************************************
00102    C WRITE OUTPUT FOR COMPOSITE
00103    C *****************************************************************************
00104      50 PREWT=0.0
00105          PER=0.0
00106          SUMASH=0.0
00107          SUMPS=0.0
00108          SUMTS=0.0
00109          SUMBTU=0.0
00110          DO 9 J=1,NGRAV
00111          W=0.0
00112          ASH=0.0
```

```
00113          PS=0.0
00114          TS=0.0
00115          ZBTU=0.0
00116          DO 6 I=1,NSIZE
00117          IF (J.EQ.1) PER=PER+PERCNT(I)
00118          W=W+FEED(I,J,1)
00119          ASH=ASH+FEED(I,J,1)*FEED(I,J,2)
00120          PS = PS+FEED(I,J,1)*FEED(I,J,3)
00121          TS = TS+FEED(I,J,1)*FEED(I,J,4)
00122        6 ZBTU=ZBTU+FEED(I,J,1)*BTUPLB(BTU,FEED(I,J,2))
00123    C     IF (ZBTU.LT.0.) ZBTU=0.
00124          IF (W.EQ.0.) GO TO 60
00125          ASH=100.*ASH/W
00126          PS=100.*PS/W
00127          TS=100.*TS/W
00128          ZBTU=ZBTU/W
00129       60 CUMWT=PREWT+W
00130          SUMASH=SUMASH+ASH*W
00131          SUMPS=SUMPS+PS*W
00132          SUMTS=SUMTS+TS*W
00133          SUMBTU=SUMBTU+ZBTU*W
00134          IF (CUMWT.EQ.0.) GO TO 65
00135          CUMASH=SUMASH/CUMWT
00136          CUMPS=SUMPS/CUMWT
00137          CUMTS=SUMTS/CUMWT
00138          CUMBTU=SUMBTU/CUMWT
00139       65 PREWT=CUMWT
00140          W=100.*W
00141          CUMWT=100.*CUMWT
00142          IF (NCOMP.NE.0.) PER=100.*PER
00143          IF (J.GT.1) GO TO 7
00144          WRITE (H,504) PER,GBOUND(2),W,ASH,PS,TS,ZBTU,CUMWT,CUMASH,CUMPS,
00145         1 CUMTS,CUMBTU
00146          GO TO 9
00147        7 IF (J.EQ.NGRAV) GO TO 8
00148          WRITE (H,502) GBOUND(J),GBOUND(J+1),W,ASH,PS,TS,ZBTU,CUMWT,CUMASH,
00149         1 CUMPS,CUMTS,CUMBTU
00150          GO TO 9
00151        8 WRITE (H,503) GBOUND(J),W,ASH,PS,TS,ZRTU,CUMWT,CUMASH,CUMPS,CUMTS,
00152         1 CUMBTU
00153        9 CONTINUE
00154          FLBTU=CUMBTU
00155          FL802=.02*CUMTS
00156          RETURN
00157          END
```

COMMON BLOCKS

/SYS/(+2)
G +0 I H +1 I

SUBPROGRAMS CALLED

BTUPLS

SCALARS AND ARRAYS ("a" NO EXPLICIT DECLARATION - "I" NOT REFERENCED - "#" SUBSCRIPTED)

*TS	1 R	*H	2 R	*CUMPS	3 R	*NCOMP	4 I	XBTU	5#R
FEED	17#R	*K	20 I	*SUMBTU	21 R	GBOUND	22#R	SYMBOL	23#R
*SUMASH	24 R	*PS	25 R	PERCNT	26#R	*ZBTU	55 R	*CUMTS	56 R
*BLANK	57 R	*J	60 I	*FLBTU	61 R	*SUMPS	62 R	*PRENT	63 R
*CUMBTU	64 R	*ASH	65 R	*NSIZE	66 I	*KJ	67 I	*FLBO2	70 R
BTU	71#R	*CUMMT	72 R	*PER	73 R	*CUMASH	74 R	*I	75 I
MT	76#R	*NGRAV	110 I	*KI	111 I	*SUMTS	112 R		

TEMPORARIES

.B0010	321 I	.B0011	322 I	.B0012	323 I	.B0000	324 I	.B0001	325 I
.B0002	326 I	.B0003	327 I	.B0004	330 I	.B0005	331 I	.A0016	332 R
.B0006	333 I	.B0007	334 I	.Q0000	335 I				

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	26	-	32	33	35	46	50	54	56	67
00040	-	-	71	73	74	75	76	77	104	111
00050	116	123	130	135	145	150	153	161	162	165
00060	174	201	207	210	217	224	227	231	233	235
00070	237	-	246	250	-	-	306	311	313	322
00080	331	340	347	356	365	-	376	401	402	405
00090	410	413	415	417	-	425	426	-	434	436
00100	441	-	-	-	444	445	446	447	450	451
00110	452	456	457	460	461	462	463	465	472	477
00120	506	515	524	-	540	542	546	552	556	561
00130	564	567	572	575	600	601	603	605	607	611
00140	613	615	616	621	624	-	631	632	635	-
00150	642	643	-	651	654	656	-	661		

OUTPT1 OCTAL PROG SIZE=1450 (SCALARS/ARRAYS=112 + FORMATS=206 + TEMPS/CONS=22 + CODE=670 + ARGS=216) + COMMON=2
[NO ERRORS DETECTED]

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00001         SUBROUTINE OUTPT2(SYMBOL,NSIZE,NGRAV,NCOMP,L,PSJ,GBOUND)
00002   C *****************************************************************************
00003   C THIS SUBROUTINE PRINTS SUMMARY DATA BY SIZE INCREMENTS FOR EACH UNIT         *
00004   C                                                                              *
00005   C ARRAY NAMES ARE IDENTIFIED BY THEIR CORRESPONDING FORMAT STATEMENTS          *
00006   C *****************************************************************************
00007         DIMENSION SYMBOL(6,23),STORE(6),COMP(6),GBOUND(11)
00008         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),          * DIM *
00009        1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),  * DIM *
00010        2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),   * DIM *
00011        3              SPE(24),SIMP(24),SEA(24)                            * DIM *
00012         COMMON /BLK2/ DISTRB(24,10)                                        * DIM *
00013         COMMON /SYS/ G,H                                                   * DIM *
00014         INTEGER G,H
00015         INTEGER PSJ
00016         DATA BLANK,BY,COMP /1H ,2HBY,1H ,1HC,1HO,1HM,1HP,1H /              * DIM *
00017       100 FORMAT(21HOSIZE, INCHES OR MESH)
00018       101 FORMAT(26HOSCREEN ANALYSIS, PERCENT:)
00019       102 FORMAT(3X,4HFEED,37(1H.),9(2X,F5.1,2X))
00020       103 FORMAT(3X,10HCLEAN COAL,31(1H.),9(2X,F5.1,2X))
00021       104 FORMAT(3X,6HREFUSE,35(1H.),9(2X,F5.1,2X))
00022       105 FORMAT(3X,9HMIDDLINGS,32(1H.),9(2X,F5.1,2X))
00023       106 FORMAT(14HOASH, PERCENT:)
00024       107 FORMAT(25HOPYRITIC SULFUR, PERCENT:)
00025       108 FORMAT(23HOTOTAL SULFUR, PERCENT:)
00026       109 FORMAT(16HOACTUAL RECOVERY,20(1H.),8H PERCENT,9(2X,F5.1,2X))
00027       110 FORMAT(21H THEORETICAL RECOVERY,15(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00028       111 FORMAT(20H RECOVERY EFFICIENCY,16(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00029       112 FORMAT(10H ASH ERROR,26(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00030       113 FORMAT(16HOFLOAT IN REFUSE,9(1H.),19H PERCENT OF PRODUCT,
00031          1 9(2X,F5.1,2X))
00032       114 FORMAT(19H SINK IN CLEAN COAL,6(1H.),9X,2HDO,8X,9(2X,F5.1,2X))
00033       115 FORMAT(25H TOTAL MISPLACED MATERIAL,3(1H.),16H PERCENT OF FEED,
00034          1 9(2X,F5.1,2X))
00035       116 FORMAT(26H NEAR GRAVITY 0.1 MATERIAL,2(1H.),6X,2HDO,8X,9(2X,F5.1,
00036          1 2X))
00037       117 FORMAT(31HOSPECIFIC GRAVITY OF SEPARATION,13(1H.),9(2X,F5.2,2X))
00038       118 FORMAT(33H PROBABLE ERROR, SPECIFIC GRAVITY,11(1H.),9(2X,F5.3,2X))
00039       119 FORMAT(13H IMPERFECTION,31(1H.),9(2X,F5.3,2X))
00040       120 FORMAT(11H ERROR AREA,33(1H.),9(2X,F5.0,2X))
00041       121 FORMAT(13H BTU RECOVERY,23(1H.),4X,2HDO,2X,9(2X,F5.1,2X))
00042       122 FORMAT(1H+,43X,9(2X,6A1,1X))
00043       123 FORMAT(44X,9(4X,A2,3X))
00044       124 FORMAT(44X,9(2X,6A1,1X))
00045       125 FORMAT(3X,4HFEED,37(1H.),9(1X,F6.2,2X))
00046       126 FORMAT(3X,10HCLEAN COAL,31(1H.),9(1X,F6.2,2X))
00047       127 FORMAT(3X,6HREFUSE,35(1H.),9(1X,F6.2,2X))
00048       128 FORMAT(3X,9HMIDDLINGS,32(1H.),9(1X,F6.2,2X))
00049       130 FORMAT(3X,18HFEED (COAL + ROCK),23(1H.),9(2X,F5.1,2X))
00050       131 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H.),9(2X,F5.1,2X))
00051       132 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H.),9(2X,F5.1,2X))
00052       133 FORMAT(3X,18HFEED (COAL + ROCK),23(1H.),9(1X,F6.2,2X))
00053       134 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H.),9(1X,F6.2,2X))
00054       135 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H.),9(1X,F6.2,2X))
00055       136 FORMAT(23HOCOAL PRODUCT/COAL FEED,13(1H.),8H PERCENT,
00056          1 9(2X,F5.1,2X))
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00057      137 FORMAT(24H COAL IN OVERFLOW STREAM,15(1H,),1X,2HDO,2X,
00058     1 9(2X,F5.1,2X))
00059      138 FORMAT(25H ROCK IN UNDERFLOW STREAM,14(1H,),1X,2HDO,2X,
00060     1 9(2X,F5.1,2X))
00061      140 FORMAT(3X,12HCRUSHED COAL,29(1H,),9(2X,F5.1,2X))
00062      141 FORMAT(3X,12HCRUSHED COAL,29(1H,),9(1X,F6.2,2X))
00063      150 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H,),9(2X,F5.1,2X))
00064      151 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H,),9(2X,F5.1,2X))
00065      152 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H,),9(1X,F6.2,2X))
00066      153 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H,),9(1X,F6.2,2X))
00067      154 FORMAT(32HOWEIGHT RATIO, UNDERFLOW TO FEED,4(1H,),8H PERCENT,
00068     1 9(2X,F5.1,2X))
00069      155 FORMAT(29H BTU RATIO, UNDERFLOW TO FEED,7(1H,),4X,2HDO,2X,
00070     1 9(2X,F5.1,2X))
00071      156 FORMAT(38H UNDERSIZE MATERIAL IN OVERFLOW STREAM,1H,,1X,2HDO,2X,
00072     1 9(2X,F5.1,2X))
00073      157 FORMAT(38H OVERSIZE MATERIAL IN UNDERFLOW STREAM,1H,,1X,2HDO,2X,
00074     1 9(2X,F5.1,2X))
00075      160 FORMAT(3X,6HFEED 1,35(1H,),9(2X,F5.1,2X))
00076      161 FORMAT(3X,6HFEED 2,35(1H,),9(2X,F5.1,2X))
00077      162 FORMAT(3X,7HPRODUCT,34(1H,),9(2X,F5.1,2X))
00078      163 FORMAT(3X,6HFEED 1,35(1H,),9(1X,F6.2,2X))
00079      164 FORMAT(3X,6HFEED 2,35(1H,),9(1X,F6.2,2X))
00080      165 FORMAT(3X,7HPRODUCT,34(1H,),9(1X,F6.2,2X))
00081      170 FORMAT(37H1DISTRIBUTION, PERCENT TO WASHED COAL)
00082      171 FORMAT(2X,28H(SPECIFIC GRAVITY FRACTION)1)
00083      172 FORMAT(2X,6HFLOAT ,F4.2,32(1H,),9(2X,F5.1,2X))
00084      173 FORMAT(3X,F4.2,1H-,F4.2,32(1H,),9(2X,F5.1,2X))
00085      174 FORMAT(3X,5HSINK ,F4.2,32(1H,),9(2X,F5.1,2X))
00086      175 FORMAT(30H0BTU PER POUND, MOISTURE FREE1)
00087      176 FORMAT(3X,4HFEED,37(1H,),9(1X,F6.0,2X))
00088      177 FORMAT(3X,10HCLEAN COAL,31(1H,),9(1X,F6.0,2X))
00089      178 FORMAT(3X,6HREFUSE,35(1H,),9(1X,F6.0,2X))
00090      179 FORMAT(3X,9HMIDDLINGS,32(1H,),9(1X,F6.0,2X))
00091      180 FORMAT(3X,12HCRUSHED COAL,29(1H,),9(1X,F6.0,2X))
00092      181 FORMAT(3X,6HFEED 1,35(1H,),9(1X,F6.0,2X))
00093      182 FORMAT(3X,6HFEED 2,35(1H,),9(1X,F6.0,2X))
00094      183 FORMAT(3X,7HPRODUCT,34(1H,),9(1X,F6.0,2X))
00095      184 FORMAT(3X,24HOVERFLOW (COARSE) STREAM,17(1H,),9(1X,F6.0,2X))
00096      185 FORMAT(3X,23HUNDERFLOW (FINE) STREAM,18(1H,),9(1X,F6.0,2X))
00097      186 FORMAT(3X,18HFEED (COAL + ROCK),23(1H,),9(1X,F6.0,2X))
00098      187 FORMAT(3X,24HOVERFLOW (REFUSE) STREAM,17(1H,),9(1X,F6.0,2X))
00099      188 FORMAT(3X,26HUNDERFLOW (PRODUCT) STREAM,15(1H,),9(1X,F6.0,2X))
00100      190 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H,),9(2X,F5.1,2X))
00101      191 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H,),9(2X,F5.1,2X))
00102      192 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H,),9(1X,F6.2,2X))
00103      193 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H,),9(1X,F6.2,2X))
00104      194 FORMAT(3X,24HPRODUCT 1 (UPPER STREAM),17(1H,),9(1X,F6.0,2X))
00105      195 FORMAT(3X,24HPRODUCT 2 (LOWER STREAM),17(1H,),9(1X,F6.0,2X))
00106      200 FORMAT(1H0,132(1H*)/)
00107      300 FORMAT(1H0,5X,17HEMPTY FEED STREAM/)
00108    C DETERMINE LARGEST NONEMPTY SIZE INCREMENT
00109          DO 20 I=1,NSIZE
00110          IF ((L.NE.41).AND.(SPEED(I,1).LT.1.01E-2*NGRAV)) GO TO 20
               IF ((L.EQ.41).AND.(SREF(I,1).LT.1.01E-2*NGRAV)) GO TO 20
00111          NSTART=I
00112          GO TO 21
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00113      20 CONTINUE
00114         WRITE (H,300)
00115         RETURN
00116      21 NS=NSIZE+1
00117         K1=NSTART
00118         K2=NSTART+8
00119         IF (NCOMP.NE.0) K1=NS
00120         DO 3 I=1,NS
00121         KNB=0
00122         KP=0
00123         DO 1 K=1,6
00124         IF (SYMBOL(K,I).NE.BLANK) KNB=KNB+1                              * DIM *
00125         IF ((KP.EQ.0).AND.(SYMBOL(K,I).NE.BLANK)) KP=K
00126         STORE(K)=SYMBOL(K,I)
00127       1 SYMBOL(K,I)=BLANK
00128         KBL=3-KNB/2
00129         IF (KNB.EQ.3) KBL=1
00130         IF (KNB.EQ.5) KBL=0
00131         DO 2 K=1,KNB
00132         KA=KBL+K
00133         KB=KP+K-1
00134       2 SYMBOL(KA,I)=STORE(KB)
00135       3 CONTINUE
00136         IF ((NCOMP.EQ.0).AND.(NSIZE.EQ.1)) NS=1
00137       4 IF (K2.GT.NS) K2=NS
00138         WRITE (H,100)
00139         IF ((NS.GT.1).AND.(K2.EQ.NS)) GO TO 5
00140         WRITE (H,122) ((SYMBOL(K,I),K=1,6),I=K1,K2)
00141         WRITE (H,123) (BY,I=K1,K2)                                       * DIM *
00142         WRITE (H,124) ((SYMBOL(K,I+1),K=1,6),I=K1,K2)                    * DIM *
00143         GO TO 7
00144       5 IF (K1.EQ.NS) GO TO 6
00145         WRITE (H,122) ((SYMBOL(K,I),K=1,6),I=K1,NSIZE),COMP              * DIM *
00146         WRITE (H,123) (BY,I=K1,NSIZE)                                    * DIM *
00147         WRITE (H,124) ((SYMBOL(K,I+1),K=1,6),I=K1,NSIZE)
00148         GO TO 7
00149       6 WRITE (H,122) COMP
00150       7 WRITE (H,101)
00151         IF (L.LE.7) GO TO 600
00152         IF (L.EQ.11) GO TO 650
00153         IF ((L.GE.12).AND.(L.LE.19)) GO TO 700
00154         IF ((L.GE.21).AND.(L.LE.24)) GO TO 750
00155         IF (L.EQ.41) GO TO 800
00156         IF (L.EQ.51) GO TO 900
00157         RETURN
00158   C PRINT SUMMARY DATA FOR WASHING VESSELS
00159     600 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00160         WRITE (H,103) (SCC(I,1),I=K1,K2)
00161         WRITE (H,104) (SREF(I,1),I=K1,K2)
00162         IF (L.EQ.6) WRITE (H,105) (SMID(I,1),I=K1,K2)
00163         WRITE (H,106)
00164         WRITE (H,102) (SFEED(I,2),I=K1,K2)
00165         WRITE (H,103) (SCC(I,2),I=K1,K2)
00166         WRITE (H,104) (SREF(I,2),I=K1,K2)
00167         IF (L.EQ.6) WRITE (H,105) (SMID(I,2),I=K1,K2)
00168         WRITE (H,107)
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00169          WRITE (H,125) (SFEED(I,3),I=K1,K2)
00170          WRITE (H,126) (SCC(I,3),I=K1,K2)
00171          WRITE (H,127) (SREF(I,3),I=K1,K2)
00172          IF (L.EQ.6) WRITE (H,128) (SMID(I,3),I=K1,K2)
00173          WRITE (H,108)
00174          WRITE (H,125) (SFEED(I,4),I=K1,K2)
00175          WRITE (H,126) (SCC(I,4),I=K1,K2)
00176          WRITE (H,127) (SREF(I,4),I=K1,K2)
00177          IF (L.EQ.6) WRITE (H,128) (SMID(I,4),I=K1,K2)
00178          WRITE (H,175)
00179          WRITE (H,176) (SFEED(I,5),I=K1,K2)
00180          WRITE (H,177) (SCC(I,5),I=K1,K2)
00181          WRITE (H,178) (SREF(I,5),I=K1,K2)
00182          IF (L.EQ.6) WRITE (H,179) (SMID(I,5),I=K1,K2)
00183          WRITE (H,109) (SYLD(I),I=K1,K2)
00184          IF (L.EQ.7) GO TO 8
00185          WRITE (H,110) (TYLD(I),I=K1,K2)
00186          WRITE (H,111) (EFFIC(I),I=K1,K2)
00187        8 WRITE (H,121) (BTUREC(I),I=K1,K2)
00188          IF (L.EQ.7) GO TO 9
00189          WRITE (H,112) (ASHERR(I),I=K1,K2)
00190          IF (PSJ.EQ.0) GO TO 9
00191          WRITE (H,113) (SFLT(I),I=K1,K2)
00192          WRITE (H,114) (SINK(I),I=K1,K2)
00193          WRITE (H,115) (SMISPL(I),I=K1,K2)
00194          WRITE (H,116) (SNRGR(I),I=K1,K2)
00195          WRITE (H,117) (SGRAV(I),I=K1,K2)
00196          WRITE (H,118) (SPE(I),I=K1,K2)
00197          WRITE (H,119) (SIMP(I),I=K1,K2)
00198          WRITE (H,120) (SEA(I),I=K1,K2)
00199          WRITE (H,170)
00200          WRITE (H,171)
00201          WRITE (H,172) GBOUND(2),(DISTRB(I,1),I=K1,K2)
00202          NLIM=NGRAV-1
00203          DO 625 J=2,NLIM
00204      625 WRITE (H,173) GBOUND(J),GBOUND(J+1),(DISTRB(I,J),I=K1,K2)
00205          WRITE (H,174) GBOUND(NGRAV), (DISTRB(I,NGRAV),I=K1,K2)
00206          GO TO 9
00207    C PRINT SUMMARY DATA FOR ROTARY BREAKER
00208      650 WRITE (H,130) (SFEED(I,1),I=K1,K2)
00209          WRITE (H,131) (SCC(I,1),I=K1,K2)
00210          WRITE (H,132) (SREF(I,1),I=K1,K2)
00211          WRITE (H,106)
00212          WRITE (H,130) (SFEED(I,2),I=K1,K2)
00213          WRITE (H,131) (SCC(I,2),I=K1,K2)
00214          WRITE (H,132) (SREF(I,2),I=K1,K2)
00215          WRITE (H,107)
00216          WRITE (H,133) (SFEED(I,3),I=K1,K2)
00217          WRITE (H,134) (SCC(I,3),I=K1,K2)
00218          WRITE (H,135) (SREF(I,3),I=K1,K2)
00219          WRITE (H,108)
00220          WRITE (H,133) (SFEED(I,4),I=K1,K2)
00221          WRITE (H,134) (SCC(I,4),I=K1,K2)
00222          WRITE (H,135) (SREF(I,4),I=K1,K2)
00223          WRITE (H,175)
00224          WRITE (H,186) (SFEED(I,5),I=K1,K2)
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00225          WRITE (H,187) (SCC(I,5),I=K1,K2)
00226          WRITE (H,188) (SREF(I,5),I=K1,K2)
00227          WRITE (H,136) (SYLD(I),I=K1,K2)
00228          WRITE (H,137) (SFLT(I),I=K1,K2)
00229          WRITE (H,138) (SINK(I),I=K1,K2)
00230          GO TO 9
00231    C PRINT SUMMARY DATA FOR CRUSHERS
00232      700 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00233          WRITE (H,140) (SCC(I,1),I=K1,K2)
00234          WRITE (H,106)
00235          WRITE (H,102) (SFEED(I,2),I=K1,K2)
00236          WRITE (H,140) (SCC(I,2),I=K1,K2)
00237          WRITE (H,107)
00238          WRITE (H,125) (SFEED(I,3),I=K1,K2)
00239          WRITE (H,141) (SCC(I,3),I=K1,K2)
00240          WRITE (H,108)
00241          WRITE (H,125) (SFEED(I,4),I=K1,K2)
00242          WRITE (H,141) (SCC(I,4),I=K1,K2)
00243          WRITE (H,175)
00244          WRITE (H,176) (SFEED(I,5),I=K1,K2)
00245          WRITE (H,180) (SCC(I,5),I=K1,K2)
00246          GO TO 9
00247    C PRINT SUMMARY DATA FOR SCREENS
00248      750 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00249          WRITE (H,150) (SCC(I,1),I=K1,K2)
00250          WRITE (H,151) (SREF(I,1),I=K1,K2)
00251          WRITE (H,106)
00252          WRITE (H,102) (SFEED(I,2),I=K1,K2)
00253          WRITE (H,150) (SCC(I,2),I=K1,K2)
00254          WRITE (H,151) (SREF(I,2),I=K1,K2)
00255          WRITE (H,107)
00256          WRITE (H,125) (SFEED(I,3),I=K1,K2)
00257          WRITE (H,152) (SCC(I,3),I=K1,K2)
00258          WRITE (H,153) (SREF(I,3),I=K1,K2)
00259          WRITE (H,108)
00260          WRITE (H,125) (SFEED(I,4),I=K1,K2)
00261          WRITE (H,152) (SCC(I,4),I=K1,K2)
00262          WRITE (H,153) (SREF(I,4),I=K1,K2)
00263          WRITE (H,175)
00264          WRITE (H,176) (SFEED(I,5),I=K1,K2)
00265          WRITE (H,184) (SCC(I,5),I=K1,K2)
00266          WRITE (H,185) (SREF(I,5),I=K1,K2)
00267          WRITE (H,154) (SYLD(I),I=K1,K2)
00268          WRITE (H,155) (BTUREC(I),I=K1,K2)
00269    C     WRITE (H,156) (SFLT(I),I=K1,K2)
00270    C     WRITE (H,157) (SINK(I),I=K1,K2)
00271          GO TO 9
00272    C PRINT SUMMARY DATA FOR BLENDERS
00273      800 WRITE (H,160) (SFEED(I,1),I=K1,K2)
00274          WRITE (H,161) (SCC(I,1),I=K1,K2)
00275          WRITE (H,162) (SREF(I,1),I=K1,K2)
00276          WRITE (H,106)
00277          WRITE (H,160) (SFEED(I,2),I=K1,K2)
00278          WRITE (H,161) (SCC(I,2),I=K1,K2)
00279          WRITE (H,162) (SREF(I,2),I=K1,K2)
00280          WRITE (H,107)
```

```
00281          WRITE (H,163) (SFEED(I,3),I=K1,K2)
00282          WRITE (H,164) (SCC(I,3),I=K1,K2)
00283          WRITE (H,165) (SREF(I,3),I=K1,K2)
00284          WRITE (H,108)
00285          WRITE (H,163) (SFEED(I,4),I=K1,K2)
00286          WRITE (H,164) (SCC(I,4),I=K1,K2)
00287          WRITE (H,165) (SREF(I,4),I=K1,K2)
00288          WRITE (H,175)
00289          WRITE (H,181) (SFEED(I,5),I=K1,K2)
00290          WRITE (H,182) (SCC(I,5),I=K1,K2)
00291          WRITE (H,183) (SREF(I,5),I=K1,K2)
00292          GO TO 9
00293    C PRINT SUMMARY DATA FOR SPLITTERS
00294      900 WRITE (H,102) (SFEED(I,1),I=K1,K2)
00295          WRITE (H,190) (SCC(I,1),I=K1,K2)
00296          WRITE (H,191) (SREF(I,1),I=K1,K2)
00297          WRITE (H,106)
00298          WRITE (H,102) (SFEED(I,2),I=K1,K2)
00299          WRITE (H,190) (SCC(I,2),I=K1,K2)
00300          WRITE (H,191) (SREF(I,2),I=K1,K2)
00301          WRITE (H,107)
00302          WRITE (H,125) (SFEED(I,3),I=K1,K2)
00303          WRITE (H,192) (SCC(I,3),I=K1,K2)
00304          WRITE (H,193) (SREF(I,3),I=K1,K2)
00305          WRITE (H,108)
00306          WRITE (H,125) (SFEED(I,4),I=K1,K2)
00307          WRITE (H,192) (SCC(I,4),I=K1,K2)
00308          WRITE (H,193) (SREF(I,4),I=K1,K2)
00309          WRITE (H,175)
00310          WRITE (H,181) (SFEED(I,5),I=K1,K2)
00311          WRITE (H,194) (SCC(I,5),I=K1,K2)
00312          WRITE (H,195) (SREF(I,5),I=K1,K2)
00313        9 IF (K2.EQ.N8) RETURN
00314          WRITE (H,200)
00315          K1=K2+1
00316          K2=K2+9
00317          GO TO 4
00318          RETURN
00319          END
```

COMMON BLOCKS

/BLK1/(+1430)

SFEED	+0#R	SCC	+170#R	SMID	+360#R	SREF	+550#R	SYLD	+740#R		
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ABHERR	+1100#R	SFLT	+1130#R		
SINK	+1160#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R		
SIMP	+1350#R	SEA	+1400#R								

/BLK2/(+360)

DISTRB	+0#R

/SYS/(+2)

G	+0 I	H	+1 I

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ("*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED)

*NCOMP	1 I	*NS	2 I	PSJ	3 I	*KB	4 I	*BV	5 R
*K1	6 I	*K	7 I	GBOUND	10#R	*KA	11 I	SYMBOL	12#R
*KBL	13 I	*KNB	14 I	*BLANK	15 R	*J	16 I	*KP	17 I
STORE	20#R	*NSIZE	26 I	*NSTART	27 I	COMP	30#R	*L	36 I
*I	37 I	*NGRAV	40 I	*NLIM	41 I	*K2	42 I		

TEMPORARIES

.$0021	1432 I	.$0022	1433 I	.$0110	1434 I	.$0023	1435 I	.$0111	1436 I
.$0070	1437 I	.$0024	1440 I	.$0112	1441 I	.$0071	1442 I	.$0025	1443 I
.$0113	1444 I	.$0072	1445 I	.$0026	1446 I	.$0160	1447 I	.$0114	1450 I
.$0073	1451 I	.$0027	1452 I	.$0161	1453 I	.$0115	1454 I	.$0074	1455 I
.$0162	1456 I	.$0116	1457 I	.$0075	1460 I	.$0163	1461 I	.$0117	1462 I
.$0076	1463 I	.$0164	1464 I	.$0077	1465 I	.$0165	1466 I	.$0166	1467 I
.$0167	1470 I	.$0010	1471 I	.$0011	1472 I	.$0012	1473 I	.$0100	1474 I
.$0013	1475 I	.$0101	1476 I	.$0060	1477 I	.$0014	1500 I	.$0102	1501 I
.$0061	1502 I	.$0015	1503 I	.$0103	1504 I	.$0062	1505 I	.$0016	1506 I
.$0150	1507 I	.$0104	1510 I	.$0063	1511 I	.$0017	1512 I	.$0151	1513 I
.$0105	1514 I	.$0064	1515 I	.$0152	1516 I	.$0106	1517 I	.$0065	1520 I
.$0153	1521 I	.$0107	1522 I	.$0066	1523 I	.$0154	1524 I	.$0067	1525 I
.$0155	1526 I	.$0156	1527 I	.$0157	1530 I	.$0000	1531 I	.$0001	1532 I
.$0002	1533 I	.$0003	1534 I	.$0050	1535 I	.$0004	1536 I	.$0051	1537 I
.$0005	1540 I	.A0016	1541 R	.$0052	1542 I	.$0006	1543 I	.$0140	1544 I
.$0053	1545 I	.$0007	1546 I	.$0141	1547 I	.$0054	1550 I	.$0142	1551 I
.$0055	1552 I	.$0143	1553 I	.$0056	1554 I	.$0144	1555 I	.$0057	1556 I
.$0145	1557 I	.$0146	1560 I	.$0147	1561 I	.$0040	1562 I	.$0041	1563 I
.$0042	1564 I	.$0130	1565 I	.$0043	1566 I	.$0131	1567 I	.$0044	1570 I
.$0132	1571 I	.$0045	1572 I	.$0133	1573 I	.$0046	1574 I	.$0134	1575 I
.$0047	1576 I	.$0135	1577 I	.$0136	1600 I	.$0137	1601 I	.$0030	1602 I
.$0031	1603 I	.$0032	1604 I	.$0120	1605 I	.$0033	1606 I	.$0121	1607 I
.$0034	1610 I	.$0122	1611 I	.$0035	1612 I	.$0123	1613 I	.$0036	1614 I
.$0170	1615 I	.$0124	1616 I	.$0037	1617 I	.$0171	1620 I	.$0125	1621 I
.$0172	1622 I	.$0126	1623 I	.$0173	1624 I	.$0127	1625 I	.$0174	1626 I
.$0175	1627 I	.$0020	1630 I						

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	-	-	-	-	-	-	-	-	-	-

```
00060 : -     -     -     -     -     -     -     -     -     -
00070 : -     -     -     -     -     -     -     -     -     -
00080 : -     -     -     -     -     -     -     -     -     -
00090 : -     -     -     -     -     -     -     -     -     -
00100 : -     -     -     -     -     -     -     -     -     -
00110 : 22    27    30    31    33    36    37    42    44    17
00120 : 51    55    56    57    60    67    100   106   115   46
00130 : 130   132   134   137   143   153   156   165   170   123
00140 : 201   231   247   277   300   303   334   352   402   173
00150 : 407   412   415   417   423   427   431   433   -     403
00160 : 453   472   511   533   536   555   574   613   635   434
00170 : 657   676   715   737   742   761   1000  1017  1041  640
00180 : 1063  1102  1121  1143  1162  1165  1204  1223  1242  1044
00190 : 1264  1266  1305  1324  1343  1362  1401  1420  1437  1245
00200 : 1461  1464  1506  1511  1514  1543  1570  -     1571  1456
00210 : 1627  1646  1651  1670  1707  1726  1731  1750  1767  1610
00220 : 2011  2030  2047  2066  2071  2110  2127  2146  2165  2006
00230 : 2223  -     2224  2243  2262  2265  2304  2323  2326  2204
00240 : 2364  2367  2406  2425  2430  2447  2466  -     2467  2345
00250 : 2525  2544  2547  2566  2605  2624  2627  2646  2665  2506
00260 : 2707  2726  2745  2764  2767  3006  3025  3044  3063  2704
00270 : -     3102  -     3103  3122  3141  3160  3163  3202  -
00280 : 3240  3243  3262  3301  3320  3323  3342  3361  3400  3221
00290 : 3422  3441  3460  -     3461  3500  3517  3536  3541  3403
00300 : 3577  3616  3621  3640  3657  3676  3701  3720  3737  3560
00310 : 3761  4000  4017  4036  4041  4044  4046  4050  -     3756
                                                            4051

OUTPT2  OCTAL PROG SIZE=10262  [ SCALARS/ARRAYS=42 + FORMATS=1367 + TEMPS/CONS=202 + CODE=4054 + ARGS=2353 ]  + COMMON=2012
[ NO ERRORS DETECTED ]
```

```
OUTPT3  OUTPT3.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:29   PAGE 1

00001          SUBROUTINE OUTPT3(FEED,BTU,YFLOW,NSIZE,NGRAV)
00002     C ***************************************************************************
00003     C THIS SUBROUTINE CALCULATES THE MEAN PERCENT ASH, PYRITIC SULFUR,          *
00004     C TOTAL SULFUR, BTU CONTENT AND LBS SO2/MILLION BTU                         *
00005     C FOR A GIVEN FLOWSTREAM                                                    *
00006     C                                                                           *
00007     C EACH OF THESE QUANTITIES IS THEN PRINTED OUT                              *
00008     C ***************************************************************************
00009          DIMENSION FEED(23,10,4),BTU(4)
00010          COMMON /SYS/ G,H
00011          INTEGER G,H
00012        100 FORMAT(1H0,5X,18HFLOWSTREAM SUMMARY/)
00013        101 FORMAT(1H0,5X,11HFLOWRATE = ,F5.1,16H PERCENT OF FEED,5X,6HASH = ,
00014           1 F6.1,8H PERCENT,5X,17HPYRITIC SULFUR = ,F4.2,8H PERCENT,5X,
00015           2 15HTOTAL SULFUR = ,F4.2,8H PERCENT/,1H0,5X,14HBTU CONTENT = ,
00016           3 F6.0,7H BTU/LB/,1H0,5X,14HSO2 CONTENT = ,F5.2,
00017           4 26H LBS SO2/MILLION BTU)
00018          SUM1=0.
00019          SUM2=0.
00020          SUM3=0.
00021          SUM4=0.
00022          YIELD=100.*YFLOW
00023          DO 1 I=1,NSIZE
00024          DO 1 J=1,NGRAV
00025          SUM1=SUM1+100.*FEED(I,J,1)*FEED(I,J,2)
00026          SUM2=SUM2+100.*FEED(I,J,1)*FEED(I,J,3)
00027          SUM3=SUM3+100.*FEED(I,J,1)*FEED(I,J,4)
00028        1 SUM4=SUM4+FEED(I,J,1)*BTUPLB(BTU,FEED(I,J,2))
00029          IF (SUM4.LT.0.) SUM4=0.
00030          SO2=9999.
00031          IF (SUM4.GT.0.) SO2=2.E+4*SUM3/SUM4
00032          WRITE (H,100)
00033          WRITE (H,101) YIELD,SUM1,SUM2,SUM3,SUM4,SO2
00034          RETURN
00035          END

COMMON BLOCKS

/SYS/(+2)
G             +0 I       H             +1 I

SUBPROGRAMS CALLED

BTUPLB

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED )

*SO2          1 R        FEED          2#R        *YFLOW        3 R        *J            4 I        *SUM4         5 R
*SUM3         6 R        *NSIZE        7 I        BTU           10#R       *SUM2         11 R       *I            12 I
*NGRAV        13 I       *YIELD        14 R       *SUM1         15 R
```

```
OUTPT3  OUTPT3.FA        FORTRAN V.5A(563) /KI   6-OCT-77          12:29   PAGE 1-1

TEMPORARIES

 .S0000    107 I          .S0001    110 I          .A0016    111 R          .Q0000    112 I

LINE NUMBER/OCTAL LOCATION MAP

       : 0       1       2       3       4       5       6       7       8       9
-------:-------------------------------------------------------------------------------
       :
00000 : -       0       -       -       -       -       -       -       -       -
00010 : -       -       -       -       -       -       -       -       -       -
00020 : 15      16      17      22      26      30      40      50      13      14
00030 : 102     104     112     115     -       121     -       -       60      77

OUTPT3  OCTAL PROG SIZE=270  [ SCALARS/ARRAYS=15 + FORMATS=71 + TEMPS/CONS=7 + CODE=124 + ARGS=27 ]  + COMMON=2
[ NO ERRORS DETECTED ]
```

```
00001         SUBROUTINE OUTPT4(SG,L,D1,D2,D3,VSLYLD,VSLBTU,KF,S,FLOW,NUNITS,
00002        1  NFLOWS,NSIZE,NGRAV,S1,S2,S3,S4,S5,S6,BTU)
00003    C*************************************************************************
00004    C
00005    C  THIS SUBROUTINE CALCULATES AND PRINTS SUMMARY DATA FOR ALL
00006    C  UNITS AND FLOWSTREAMS
00007    C
00008    C*************************************************************************
00009         COMMON STREAM(23,10,4)                                          * DIM *
00010         DIMENSION SG(920,28),D1(30),D2(30),D3(30),L(30),VSLYLD(30),     * DIM *
00011        1  VSLBTU(30),KF(2,25),S(25),FLOW(28),BTU(4)                     * DIM *
00012         COMMON /BYS/ G,H
00013         INTEGER G,H
00014       100 FORMAT(1H1,50X,22HSUMMARY DATA FOR UNITS)
00015       101 FORMAT(1H0,84X,5HYIELD,8X,12HBTU RECOVERY)
00016       102 FORMAT(1H ,8X,11HUNIT NUMBER,8X,9HUNIT TYPE,20X,
00017          1       18HDECISION VARIABLES,8X,9H(PERCENT),7X,9H(PERCENT))
00018       103 FORMAT(1H0,12X,I2,7X,I2)
00019       104 FORMAT(1H+,62X,F6.3,16X,F5.1,11X,F5.1)
00020       105 FORMAT(1H+,62X,F6.3)
00021       106 FORMAT(1H+,54X,F6.3,2X,F6.3,2X,F6.3)
00022       107 FORMAT(1H ,8X,11(1H=),8X,9(1H=),20X,18(1H=),8X,9(1H=),6X,12(1H=))
00023       108 FORMAT(1H+,84X,F5.1,11X,F5.1)
00024       200 FORMAT(1H1,45X,26HSUMMARY DATA FOR FLOWSTREAMS)
00025       201 FORMAT(1H0,64X,8HFLOWRATE,15X,7HPYRITIC,5X,5HTOTAL)
00026       202 FORMAT(1H ,6X,10HFLOWSTREAM,20X,6HORIGIN,5X,11HDESTINATION,
00027          1       6X,8H(PERCENT,   6X,3HASH,6X,6HSULFUR,6X,6HSULFUR,14X,
00028          2       8HLBS SO2/)
00029       203 FORMAT(1H ,8X,6HNUMBER,21X,8HUNIT NO.,5X,8HUNIT NO.,8X,
00030          1       8HOF FEED),3X,9H(PERCENT),2X,9H(PERCENT),3X,
00031          2       9H(PERCENT),2X,7HBTU/LB.,2X,11HMILLION BTU)
00032       204 FORMAT(1H0,10X,I2,24X,I2,2X,A2,9X,I2,12X,F5.1,7X,F5.1,6X,
00033          1  F5.2,6X,F5.2,6X,F6.0,5X,F5.2)
00034       205 FORMAT(1H+,14X,6H(FEED))
00035       206 FORMAT(1H+,14X,20H(CLEAN COAL PRODUCT))
00036       207 FORMAT(1H+,14X,19H(MIDDLINGS PRODUCT))
00037       208 FORMAT(1H+,14X,16H(REFUSE PRODUCT))
00038       209 FORMAT(1H ,6X,10(1H=),19X,8(1H=),4X,11(1H=),6X, 8(1H=),
00039          1       3X,9(1H=),2X,9(1H=),3X,9(1H=),2X,7(1H=),2X,11(1H=))
00040    C PRINT SUMMARY DATA FOR UNITS
00041         WRITE (H,100)
00042         WRITE (H,101)
00043         WRITE (H,102)
00044         WRITE (H,107)
00045         DO 10 IU=1,NUNITS
00046         WRITE (H,103) IU,L(IU)
00047         IF (L(IU).EQ.41) GO TO 10
00048         IF (L(IU).LE.6) WRITE (H,104) D1(IU),VSLYLD(IU),VSLBTU(IU)
00049         IF (L(IU).EQ.7) WRITE (H,108) VSLYLD(IU),VSLBTU(IU)
00050         IF ((L(IU).GT.7).AND.(L(IU).NE.11)) WRITE (H,105) D1(IU)
00051         IF (L(IU).EQ.11) WRITE (H,106) D1(IU),D2(IU),D3(IU)
00052       10 CALL VESSEL(L(IU),3)
00053    C PRINT SUMMARY DATA FOR FLOWSTREAMS
00054         WRITE (H,200)
00055         WRITE (H,201)
00056         WRITE (H,202)
```

```
OUTPT4  OUTPT4.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:32   PAGE 1-1

00057          WRITE (H,203)
00058          WRITE (H,209)
00059          DO 30 IF=1,NFLOWS
00060          SUM1=0.
00061          SUM2=0.
00062          SUM3=0.
00063          SUM4=0.
00064          IG=IF
00065          CALL EXPAND(SG,STREAM,IG,NSIZE,NGRAV)
00066          DO 20 I=1,NSIZE
00067          DO 20 J=1,NGRAV
00068          SUM1=SUM1+100.*STREAM(I,J,1)*STREAM(I,J,2)
00069          SUM2=SUM2+100.*STREAM(I,J,1)*STREAM(I,J,3)
00070          SUM3=SUM3+100.*STREAM(I,J,1)*STREAM(I,J,4)
00071       20 SUM4=SUM4+STREAM(I,J,1)*BTUPLB(BTU,STREAM(I,J,2))
00072          IF (SUM4.LT.0.) SUM4=0.
00073          FLOWPC=100.*FLOW(IF)
00074          S02=9999.
00075          IF (SUM4.GT.0.) S02=2.E+4*SUM3/SUM4
00076          WRITE (H,204) IF,KF(1,IF),S(IF),KF(2,IF),FLOWPC,SUM1,SUM2,SUM3,
00077         1 SUM4,S02
00078          IF (KF(1,IF).EQ.0) WRITE (H,205)
00079          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S1)) WRITE (H,206)
00080          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S2)) WRITE (H,207)
00081          IF ((KF(2,IF).EQ.0).AND.(S(IF).EQ.S3)) WRITE (H,208)
00082       30 CONTINUE
00083          RETURN
00084          END

COMMON BLOCKS

/.COMM./(+1630)
STREAM          +0#R
/SYS/(+2)
G               +0 I        H               +1 I

SUBPROGRAMS CALLED

EXPAND  BTUPLB  VESSEL

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*S3          1 R     VSLYLD      2#R     *NUNITS      3 I     *S02         4 R     *IF          5 I
*FLOWPC      6 R     D3          7#R     *S2         10 R      VSLBTU     11#R     D2         12#R
*S1         13 R     S          14#R      KF         15#I     *IU         16 I     *J         17 I
 SG         20#R    *SUM4       21 R    %S6                    D1         22#R    *SUM3       23 R
*NSIZE      24 I    %S5                 *NFLOWS      25 I      BTU        26#R     FLOW       27#R
 L          30#I    *SUM2       31 R    *I           32 I     %S4                  *NGRAV      33 I
*IG         34 I    *SUM1       35 R
```

```
OUTPT4  OUTPT4.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:32   PAGE 1-2


TEMPORARIES

 .B0000    346 I         .B0001    347 I         .B0002    350 I         .B0003    351 I         .A0016    352 R
 .G0000    353 I


LINE NUMBER/OCTAL LOCATION MAP

      : 0       1       2       3       4       5       6       7       8       9
------:-------------------------------------------------------------------------------
      :
00000 : -       0       -       -       -       -       -       -       -       -
00010 : -       -       -       -       -       -       -       -       -       -
00020 : -       -       -       -       -       -       -       -       -       -
00030 : -       -       -       -       -       -       -       -       -       -
00040 : -       45      50      53      56      61      65      72      77      116
00050 : 133     151     170     -       201     204     207     212     215     220
00060 : 224     225     226     227     230     231     233     237     241     250
00070 : 257     266     304     307     314     316     324     -       335     345
00080 : 362     377     414     -       417

OUTPT4  OCTAL PROG SIZE=1244  ( SCALARS/ARRAYS=35 + FORMATS=310 + TEMPS/CONS=12 + CODE=426 + ARGS=237 )  + COMMON=1632
( NO ERRORS DETECTED )
```

```
REDUCE  REDUCE.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:30   PAGE 1

00001          SUBROUTINE REDUCE(X,Y,N,NSIZE,NGRAV)
00002     C ***************************************************************************
00003     C THIS SUBROUTINE REDUCES THE DIMENSIONALITY OF A 3-DIMENSIONAL ARRAY TO      *
00004     C A 1-DIMENSIONAL ARRAY                                                       *
00005     C ***************************************************************************
00006          DIMENSION X(23,10,4),Y(920,28)
00007          DO 1 I=1,NSIZE                                                  * DIM *
00008          DO 1 J=1,NGRAV
00009          DO 1 K=1,4
00010          IJK=40*(I-1)+4*(J-1)+K                                          * DIM *
00011        1 Y(IJK,N)=X(I,J,K)                                               * DIM *
00012          RETURN
00013          END

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED ]

*N              1 I         *K              2 I         *IJK            3 I         Y               4#R
*NSIZE          6 I          X              7#R         *I             10 I         *NGRAV         11 I         *J              5 I

TEMPORARIES

 .S0000     12 I          .S0001     13 I          .S0002     14 I


LINE NUMBER/OCTAL LOCATION MAP

       ! 0       1       2       3       4       5       6       7       8       9
-------!-------------------------------------------------------------------------------
       !
00000 ! -       0       -       -       -       -       -       12      16      22
00010 ! 23      34      -       60
```

REDUCE OCTAL PROG SIZE=100 [SCALARS/ARRAYS=11 + TEMPS/CONS=5 + CODE=62 + ARGS=0]
[NO ERRORS DETECTED]

```
00001          SUBROUTINE ROTARY(LENGTH,DIAM,HOLE,SIZE,NSIZE,NGRAV,TFEED,CPROD,
00002         1 FCPROD,RPROD,FRPROD,YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C  THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE
00005    C  ROTARY BREAKER PRODUCT FOR A GIVEN FEED.
00006    C
00007    C    VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST
00008    C      LENGTH         = BREAKER LENGTH (FEET)
00009    C      DIAM           = BREAKER DIAMETER (FEET)
00010    C      HGT            = HEIGHT FROM WHICH MATERIAL IS DROPPED (FEET)
00011    C      HOLE           = OPENING SIZE (EITHER 6.0 INCHES OR 8.0 INCHES )
00012    C      NFALL          = NUMBER OF TIMES MATERIAL IS DROPPED
00013    C      SIZE(I)        = BOUNDARIES OF COAL SIZE INCREMENTS
00014    C      NSIZE          = NUMBER OF SIZE INCREMENTS
00015    C      NGRAV          = NUMBER OF GRAVITY INCREMENTS
00016    C      FCOAL          = COAL FEED FLOW RATE
00017    C      FROCK          = ROCK FEED FLOW RATE
00018    C      TFEED(I,J,K)   = PROPERTIES OF TOTAL FEED STREAM (COAL+ROCK)
00019    C      FTOT           = TOTAL FEED STREAM FLOW RATE
00020    C      FCC            = COAL FLOW RATE IN COAL STREAM
00021    C      FRC            = ROCK FLOW RATE IN COAL STREAM
00022    C      FRR            = ROCK FLOW RATE IN ROCK STREAM
00023    C      FCR            = COAL FLOW RATE IN ROCK STREAM
00024    C      CPROD(I,J,K)   = PROPERTIES OF COAL PRODUCT STREAM
00025    C      FCPROD         = COAL PRODUCT FLOW RATE
00026    C      RPROD(I,J,K)   = PROPERTIES OF ROCK PRODUCT STREAM
00027    C      FRPROD         = ROCK PRODUCT FLOW RATE
00028    C      SYLD(I)        = PERCENT OF COAL FEED OF SIZE I REPORTING TO PRODUCT STREAM
00029    C      SFLT(I)        = PERCENT OF REFUSE STREAM OF SIZE I COMPOSED OF COAL
00030    C      SINK(I)        = PERCENT OF PRODUCT STREAM OF SIZE I COMPOSED OF ROCK
00031    C ***************************************************************************
00032          INTEGER H
00033          REAL LENGTH
00034          DIMENSION CFALL(99),CSELCT(23),RFALL(99),RSELCT(23),BRATIO(13),    * DIM *
00035         1 B(13)                                                             * DIM *
00036          COMMON C(23),CSEL(23),RSEL(23),                                    * DIM *
00037         2    SMID(23),BR(23,23),RP(23,23),CP(23,23),                       * DIM *
00038         3 COVER(23,10,4),ROVER(23,10,4),CUNDR(23,10,4),RUNDR(23,10,4)      * DIM *
00039          DIMENSION CPROD(23,10,4),RPROD(23,10,4),SIZE(23),TFEED(23,10,4)   * DIM *
00040         1,BTU(4)                                                            * DIM *
00041          COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5),          * DIM *
00042         1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),  * DIM *
00043         2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),   * DIM *
00044         3              SPE(24),SIMP(24),SEA(24)                            * DIM *
00045          COMMON /SYS/ G,H                                                   * DIM *
00046          DATA CFALL /12*.20,12*.08,12*.06,63*.05/
00047          DATA RFALL /.005,98*0.0/                                           * DIM *
00048          DATA CSELCT /23*1.0/                                               * DIM *
00049          DATA RSELCT /23*1.0/                                               * DIM *
00050          DATA B /1.0,.8927,.7035,.54,.2952,.1564,.0805,.0572,.0406,.0206,   * DIM *
00051         1 3*0./                                                             * DIM *
00052          DATA BRATIO /1.0,.8308,.5882,.4176,.2065,.1041,.0522,.0368,.026,   * DIM *
00053         1 .0131,3*0./                                                       * DIM *
00054          NFALL=LENGTH/1.3
00055          HGT=.75*DIAM
00056          A=40.0
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```
00057          IF(HOLE.GT.7.0) A=50.
00058    C SPLIT FEED STREAM INTO COAL STREAM AND ROCK STREAM
00059          NS=NSIZE-1
00060          NG=NGRAV-1
00061          FROCK=0.
00062          DO 60 I=1,NSIZE
00063          ROVER(I,NGRAV,1)=TFEED(I,NGRAV,1)*TFEED(I,NGRAV,2)-TFEED(I,NG,1)*
00064         1 TFEED(I,NG,2)
00065          IF (ROVER(I,NGRAV,1).LT.0.) ROVER(I,NGRAV,1)=0.
00066          COVER(I,NGRAV,1)=TFEED(I,NGRAV,1)-ROVER(I,NGRAV,1)
00067          FROCK=FROCK+ROVER(I,NGRAV,1)
00068          ROVER(I,NGRAV,2)=1.
00069          ROVER(I,NGRAV,3)=0.
00070          ROVER(I,NGRAV,4)=0.
00071          DO 60 J=1,NG
00072          DO 60 K=1,4
00073       60 ROVER(I,J,K)=0.                                                    * DIM *
00074          FCOAL=1.-FROCK
00075          DO 70 I=1,NSIZE
00076          ROVER(I,NGRAV,1)=ROVER(I,NGRAV,1)/FROCK
00077          COVER(I,NGRAV,1)=COVER(I,NGRAV,1)/FCOAL
00078          COVER(I,NGRAV,2)=(TFEED(I,NGRAV,1)*TFEED(I,NGRAV,2)-ROVER(I,NGRAV,
00079         1 1)*FROCK)/(COVER(I,NGRAV,1)*FCOAL)
00080          COVER(I,NGRAV,3)=(TFEED(I,NGRAV,1)*TFEED(I,NGRAV,3))/(COVER(I,
00081         1 NGRAV,1)*FCOAL)
00082          COVER(I,NGRAV,4)=(TFEED(I,NGRAV,1)*TFEED(I,NGRAV,4))/(COVER(I,
00083         1 NGRAV,1)*FCOAL)
00084          DO 70 J=1,NG
00085          COVER(I,J,1)=TFEED(I,J,1)/FCOAL
00086          DO 70 K=2,4
00087       70 COVER(I,J,K)=TFEED(I,J,K)                                          * DIM *
00088    C  COAL AND ROCK STREAM BREAKAGE
00089          DO 21 I=1,NSIZE
00090       21 SMID(I)=(SIZE(I)+SIZE(I+1))/2.0
00091          DO 23 I=1,NS
00092          BR(I,I)=1.0
00093          L=I+1
00094          DO 22 II=L,NSIZE
00095          RATIOB=SMID(II)/SMID(I)
00096          CALL INTS(BRATIO,B,RATIOB,BRK,10)
00097       22 BR(I,II)=BRK                                                       * DIM *
00098       23 BR(I,NSIZE)=0.0
00099          BR(NSIZE,NSIZE)=0.0
00100          FCUNDR=0.0
00101          FRUNDR=0.0
00102          DO 24 I=1,NSIZE
00103          DO 24 J=1,NGRAV
00104          DO 24 K=1,4
00105          CUNDR(I,J,K)=0.0                                                  * DIM *
00106          RUNDR(I,J,K)=0.0
00107       24 CONTINUE
00108          DO 25 NN=1,NFALL
00109          FRPROD=0.0
00110          FCPROD=0.0
00111          DO 26 I=1,NSIZE
00112          DO 26 J=1,NGRAV
```

```
00113          DO 26 K=1,4
00114          CPROD(I,J,K)=0.0                                                    * DIM *
00115       26 RPROD(I,J,K)=0.0
00116          RSEL(NSIZE)=0.0
00117          CSEL(NSIZE)=0.0
00118          DO 5 I=1,NS
00119          RSEL(I)=RFALL(NN)*RSELCT(I)
00120          CSEL(I)=CFALL(NN)*CSELCT(I)
00121          IF(HGT.LE.6.0) GO TO 20
00122          RSEL(I)=RSEL(I)*HGT/6.0
00123          CSEL(I)=CSEL(I)*HGT/6.0
00124       20 L=I+1
00125          DO 8 II=L,NSIZE
00126          LL=II-1
00127          RP(I,II)=(BR(I,LL)-BR(I,II))*RSEL(I)
00128          CP(I,II)=(BR(I,LL)-BR(I,II))*CSEL(I)
00129          DO 8 J=1,NGRAV
00130          RPROD(II,J,1)=ROVER(I,J,1)*RP(I,II)+RPROD(II,J,1)
00131          CPROD(II,J,1)=COVER(I,J,1)*CP(I,II)+CPROD(II,J,1)
00132          DO 9 K=2,4
00133          RPROD(II,J,K)=ROVER(I,J,1)*RP(I,II)*ROVER(I,J,K)+RPROD(II,J,K)      * DIM *
00134       9  CPROD(II,J,K)=COVER(I,J,1)*CP(I,II)*COVER(I,J,K)+CPROD(II,J,K)
00135       8  CONTINUE
00136          DO 33 J=1,NGRAV
00137          RPROD(I,J,1)=ROVER(I,J,1)*(1.0-RSEL(I))+RPROD(I,J,1)
00138       33 CPROD(I,J,1)=COVER(I,J,1)*(1.0-CSEL(I))+CPROD(I,J,1)
00139       5  CONTINUE
00140          DO 36 J=1,NGRAV
00141          RPROD(NSIZE,J,1)=ROVER(NSIZE,J,1)+RPROD(NSIZE,J,1)
00142       36 CPROD(NSIZE,J,1)=COVER(NSIZE,J,1)+CPROD(NSIZE,J,1)
00143          DO 37 I=1,NSIZE
00144          DO 37 J=1,NGRAV
00145          DO 37 K=2,4
00146          CPROD(I,J,K)=COVER(I,J,1)*(1.0-CSEL(I))*COVER(I,J,K)+CPROD(I,J,K)   * DIM *
00147          RPROD(I,J,K)=ROVER(I,J,1)*(1.0-RSEL(I))*ROVER(I,J,K)+RPROD(I,J,K)
00148          IF(RPROD(I,J,1).NE.0.0) GO TO 41
00149          RPROD(I,J,K)=0.0
00150          GO TO 42
00151       41 RPROD(I,J,K)=RPROD(I,J,K)/RPROD(I,J,1)
00152       42 IF(CPROD(I,J,1).NE.0.0) GO TO 43
00153          CPROD(I,J,K)=0.0
00154          GO TO 37
00155       43 CPROD(I,J,K)=CPROD(I,J,K)/CPROD(I,J,1)
00156       37 CONTINUE
00157    C  COAL AND ROCK STREAM SCREENING
00158          FCOVER=0.0
00159          FROVER=0.0
00160          DO 1 I=1,NSIZE
00161          SMID(I)=(SIZE(I)+SIZE(I+1))/2.0
00162          FRAC1=1.0
00163          FRAC2=1.0
00164          C1=0.0
00165          C2=0.0
00166          IF(SIZE(I)-HOLE) 2,2,3
00167       3  C1=1.0
00168          IF(SIZE(I+1)-HOLE) 11,10,10
```

```
00169        11 FRAC1=(SIZE(I)-HOLE)/ (SIZE(I)-SIZE(I+1))
00170           FRAC2=1.0-FRAC1
00171           SMID(I)=(HOLE+SIZE(I+1))/2.
00172         2 C2=1./EXP(A*(1.-SMID(I)/HOLE))
00173        10 C(I)=C1*FRAC1+C2*FRAC2
00174           IF(C(I).LT.1.0E-4) C(I)=0.0
00175         1 CONTINUE
00176           DO 4 I=1,NSIZE
00177           DO 4 J=1,NGRAV
00178           COVER(I,J,1)=C(I)*CPROD(I,J,1)
00179           ROVER(I,J,1)=C(I)*RPROD(I,J,1)
00180           IF (ROVER(I,J,1).LT.1.E-5) ROVER(I,J,1)=0.
00181           CPROD(I,J,1)=CPROD(I,J,1)-COVER(I,J,1)
00182           RPROD(I,J,1)=RPROD(I,J,1)-ROVER(I,J,1)
00183           FCOVER=FCOVER+COVER(I,J,1)
00184           FROVER=FROVER+ROVER(I,J,1)
00185           FCPROD=FCPROD+CPROD(I,J,1)
00186           FRPROD=FRPROD+RPROD(I,J,1)
00187           DO 4 K=2,4
00188           COVER(I,J,K)=CPROD(I,J,K)
00189           ROVER(I,J,K)=RPROD(I,J,K)
00190         4 CONTINUE
00191           IF (FCPROD.EQ.0.) GO TO 51
00192           DO 50 I=1,NSIZE
00193           DO 50 J=1,NGRAV
00194        50 CPROD(I,J,1)=CPROD(I,J,1)/FCPROD
00195        51 IF (FRPROD.EQ.0.) GO TO 53
00196           DO 52 I=1,NSIZE
00197           DO 52 J=1,NGRAV
00198        52 RPROD(I,J,1)=RPROD(I,J,1)/FRPROD
00199        53 CONTINUE
00200     C  ***************************************************************************
00201     C  THE FOLLOWING WRITE STATEMENTS MAY BE REMOVED
00202     C 100 FORMAT(6E20.2)
00203     C 101 FORMAT( 30X, 48H ROCK AND COAL STREAMS RESULTING FROM EACH DROP /,
00204     C    1 5X,10H COAL OVER ,10X,10H ROCK OVER ,10X,11H COAL UNDER ,10X,
00205     C    2 11H ROCK UNDER )
00206     C     IF (NN.EQ.1) WRITE (H,101)
00207     C     WRITE (H,100) FCOVER,FROVER,FCPROD,FRPROD,FCUNDR,FRUNDR
00208     C  ***************************************************************************
00209           CALL BLEND(CPROD,CUNDR,CUNDR,FCPROD,FCUNDR,FCUNDR,NSIZE,NGRAV,
00210          1 XDUMMY,YDUMMY,BTU,0)
00211           CALL BLEND(RPROD,RUNDR,RUNDR,FRPROD,FRUNDR,FRUNDR,NSIZE,NGRAV,
00212          1 XDUMMY,YDUMMY,BTU,0)
00213        25 CONTINUE
00214           IF (FROVER.EQ.0.) GO TO 47
00215           DO 46 I=1,NSIZE
00216           DO 46 J=1,NGRAV
00217        46 ROVER(I,J,1)=ROVER(I,J,1)/FROVER
00218        47 IF (FCOVER.EQ.0.) GO TO 49
00219           DO 48 I=1,NSIZE
00220           DO 48 J=1,NGRAV
00221        48 COVER(I,J,1)=COVER(I,J,1)/FCOVER
00222        49 CONTINUE
00223           FCC=FCUNDR+FCOAL
00224           FRC=FRUNDR+FROCK
```

```
00225         FCR=FCOVER*FCOAL
00226         FRR=FROVER*FROCK
00227         CALL BLEND(CUNDR,RUNDR,CPROD,FCC,FRC,FCPROD,NSIZE,NGRAV,
00228        1 XDUMMY,YDUMMY,BTU,0)
00229         CALL BLEND(COVER,ROVER,RPROD,FCR,FRR,FRPROD,NSIZE,NGRAV,
00230        1 XDUMMY,YDUMMY,BTU,0)
00231     C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00232         SUM1=0.
00233         SUM2=0.
00234         DO 80 I=1,NSIZE
00235         DO 80 J=1,NGRAV
00236         SUM1=SUM1+CPROD(I,J,1)
00237      80 SUM2=SUM2+RPROD(I,J,1)
00238         DO 81 I=1,NSIZE
00239         DO 81 J=1,NGRAV
00240         CPROD(I,J,1)=CPROD(I,J,1)/SUM1
00241      81 RPROD(I,J,1)=RPROD(I,J,1)/SUM2
00242         IF (KBSG.EQ.0) RETURN
00243     C*************************************************************************
00244     C CALCULATE SUMMARY DATA BY SIZE INCREMENTS
00245     C*************************************************************************
00246         NS = NSIZE+1
00247         DO 220 K=1,5                                                    * DIM *
00248         SFEED(NS,K)=0.
00249         SCC(NS,K)=0.
00250         SREF(NS,K)=0.
00251     220 SMD(NS,K)=0.
00252     C CALCULATE COMPOSITION OF FLOW STREAMS BY SIZE INCREMENTS
00253         DO 280 I=1,NSIZE
00254         DO 230 K=1,5                                                    * DIM *
00255         SFEED(I,K)=0.
00256         SCC(I,K)=0.
00257         SREF(I,K)=0.
00258     230 SMD(I,K)=0.
00259         DO 240 J=1,NGRAV
00260         SFEED(I,1)=SFEED(I,1)+100.*TFEED(I,J,1)
00261         SCC(I,1)=SCC(I,1)+100.*RPROD(I,J,1)
00262         SREF(I,1)=SREF(I,1)+100.*CPROD(I,J,1)
00263         DO 235 K=2,4                                                    * DIM *
00264         SFEED(I,K)=SFEED(I,K)+100.*TFEED(I,J,1)*TFEED(I,J,K)
00265         SCC(I,K)=SCC(I,K)+100.*RPROD(I,J,1)*RPROD(I,J,K)
00266         SREF(I,K)=SREF(I,K)+100.*CPROD(I,J,1)*CPROD(I,J,K)
00267     235 CONTINUE
00268         SFEED(I,5)=SFEED(I,5)+100.*TFEED(I,J,1)*BTUPLB(BTU,
00269        1 TFEED(I,J,2))
00270         SCC(I,5)=SCC(I,5)+100.*RPROD(I,J,1)*BTUPLB(BTU,
00271        1 RPROD(I,J,2))
00272         SREF(I,5)=SREF(I,5)+100.*CPROD(I,J,1)*BTUPLB(BTU,
00273        1 CPROD(I,J,2))
00274     240 CONTINUE
00275         SFEED(I,5)=SFEED(I,5)/SFEED(I,1)
00276         IF (SCC(I,1).GT.0.) SCC(I,5)=SCC(I,5)/SCC(I,1)
00277         IF (SREF(I,1).GT.0.) SREF(I,5)=SREF(I,5)/SREF(I,1)
00278         IF (SREF(I,5).LT.0.) SREF(I,5)=0.
00279         SFEED(NS,1)=SFEED(NS,1)+SFEED(I,1)
00280         SCC(NS,1)=SCC(NS,1)+SCC(I,1)
```

```
00281          $REF(NS,1)=$REF(NS,1)+$REF(I,1)
00282          DO 280 K=2,4
00283          $FEED(NS,K)=$FEED(NS,K)+$FEED(I,K)                                    * DIM *
00284          IF ($FEED(I,1).EQ.0.) GO TO 250
00285          $FEED(I,K)=100.*$FEED(I,K)/$FEED(I,1)
00286          GO TO 251
00287      250 $FEED(I,K)=0.0
00288      251 $CC(NS,K)=$CC(NS,K)+$CC(I,K)
00289          IF ($CC(I,1).EQ.0.) GO TO 255
00290          $CC(I,K)=100.*$CC(I,K)/$CC(I,1)
00291          GO TO 256
00292      255 $CC(I,K)=0.0
00293      256 $REF(NS,K)=$REF(NS,K)+$REF(I,K)
00294          IF ($REF(I,1).EQ.0.) GO TO 260
00295          $REF(I,K)=100.*$REF(I,K)/$REF(I,1)
00296          GO TO 280
00297      260 $REF(I,K)=0.0
00298      280 CONTINUE
00299          DO 290 I=1,NSIZE
00300          $FEED(NS,5)=$FEED(NS,5)+$FEED(I,1)*$FEED(I,5)/$FEED(NS,1)
00301          $CC(NS,5)=$CC(NS,5)+$CC(I,1)*$CC(I,5)/$CC(NS,1)
00302          $REF(NS,5)=$REF(NS,5)+$REF(I,1)*$REF(I,5)/$REF(NS,1)
00303          IF ($REF(NS,5).LT.0.) $REF(NS,5)=0.
00304      290 CONTINUE
00305    C CALCULATE RATIO OF COAL IN COAL PRODUCT STREAM TO COAL IN TOTAL FEED
00306    C AFTER BREAKING
00307          DO 300 I=1,NSIZE
00308      300 $YLD(I)=100.*(1.-C(I))
00309          $YLD(NS)=100.*FCUNDR
00310    C CALCULATE COAL/OVERFLOW AND ROCK/UNDERFLOW RATIOS
00311          DO 310 I=1,NS
00312          $FLT(I)=0.
00313          $INK(I)=0.
00314          $GRAV(I)=0.
00315          $PE(I)=0.
00316          $IMP(I)=0.
00317      310 $EA(I)=0.
00318          TOTAL1=0.
00319          TOTAL2=0.
00320          TOTAL3=0.
00321          TOTAL4=0.
00322          TEMP=SUM2*(FCR+FRR)
00323          IF (TEMP.EQ.0.) GO TO 312
00324          R1=FCR/TEMP
00325          GO TO 314
00326      312 R1=0.
00327      314 TEMP=SUM1*(FRC+FCC)
00328          IF (TEMP.EQ.0.) GO TO 316
00329          R2=FRC/TEMP
00330          GO TO 318
00331      316 R2=0.
00332      318 DO 340 I=1,NSIZE
00333          DO 320 J=1,NGRAV
00334          $GRAV(I)=$GRAV(I)+COVER(I,J,1)
00335          $PE(I)=$PE(I)+RUNDR(I,J,1)
00336          $IMP(I)=$IMP(I)+CPROD(I,J,1)
```

```
00337      320 SEA(I)=SEA(I)+RPROD(I,J,1)
00338          IF (SEA(I).EQ.0.) GO TO 322
00339          SFLT(I)=100.*SGRAV(I)*R1/SEA(I)
00340          GO TO 324
00341      322 SFLT(I)=0.
00342      324 IF (SIMP(I).EQ.0.) GO TO 326
00343          SINK(I)=100.*SPE(I)*R2/SIMP(I)
00344          GO TO 328
00345      326 SINK(I)=0.
00346      328 TOTAL1=TOTAL1+SGRAV(I)
00347          TOTAL2=TOTAL2+SPE(I)
00348          TOTAL3=TOTAL3+SIMP(I)
00349      340 TOTAL4=TOTAL4+SEA(I)
00350          IF (TOTAL4.EQ.0.) GO TO 342
00351          SFLT(NS)=100.*TOTAL1*R1/TOTAL4
00352          GO TO 344
00353      342 SFLT(NS)=0.
00354      344 IF (TOTAL3.EQ.0.) GO TO 346
00355          SINK(NS)=100.*TOTAL2*R2/TOTAL3
00356          RETURN
00357      346 SINK(NS)=0.
00358          RETURN
00359          END
```

COMMON BLOCKS

/.COMM./(+12357)

C	+0#R	CSEL	+27#R	RSEL	+56#R	SMID	+105#R	BR	+134#R
RP	+1155#R	CP	+2176#R	COVER	+3217#R	ROVER	+5047#R	CUNDR	+6677#R
RUNDR	+10527#R								

/BLK1/(+1430)

SFEED	+0#R	SCC	+170#R	SMD	+360#R	SREF	+550#R	SYLD	+740#R
TYLD	+770#R	EFFIC	+1020#R	BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R
SINK	+1160#R	SMISPL	+1210#R	SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R
SIMP	+1350#R	SEA	+1400#R						

/SYS/(+2)

G	+0 R	H	+1 I

SUBPROGRAMS CALLED

INTS EXP. BTUPLB BLEND

SCALARS AND ARRAYS ("*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED)

*LL	1 I	*TOTAL1	2 R	*TOTAL2	3 R	*YDUMMY	4 R	*NS	5 I
*TOTAL3	6 R	*TOTAL4	7 R	*FCOVER	10 R	*K	11 I	RFALL	12#R
TFEED	155#R	RPROD	156#R	*NG	157 I	*FCUNDR	160 R	B	161#R
%YLDVSL		CFALL	176#R	*FRPROD	341 R	CPROD	342#R	*BRK	343 R
RSELCT	344#R	*FCOAL	373 R	*FCC	374 R	*KBSG	375 I	*XDUMMY	376 R
%BTUVSL		*FRAC2	377 R	BRATIO	400#R	CSELCT	415#R	*HOLE	444 R
*FROVER	445 R	*J	446 I	*NFALL	447 I	*R2	450 R	*FRUNDR	451 R
*II	452 I	*A	453 R	*FCR	454 R	*FROCK	455 R	*DIAM	456 R

*FRAC1	457 R	*RATIOB	460 R	*NSIZE	461 I	SIZE	462#R	*C2	463 R
*R1	464 R	*FRC	465 R	*HGT	466 R	*TEMP	467 R	BTU	470#R
LENGTH	471 R	*L	472 I	*SUM2	473 R	*I	474 I	*C1	475 R
*NGRAV	476 I	*FRR	477 R	*FCPROD	500 R	*SUM1	501 R	*NN	502 I

TEMPORARIES

.S0021	503 I	.S0022	504 I	.S0023	505 I	.S0024	506 I	.S0025	507 I
.S0026	510 I	.S0027	511 I	.S0010	512 I	.S0011	513 I	.S0012	514 I
.S0013	515 I	.S0060	516 I	.S0014	517 I	.S0061	520 I	.S0015	521 I
.S0062	522 I	.S0016	523 I	.S0063	524 I	.S0017	525 I	.S0000	526 I
.S0001	527 I	.S0002	530 I	.S0003	531 I	.S0050	532 I	.S0004	533 I
.S0051	534 I	.S0005	535 I	.A0016	536 R	.S0052	537 I	.S0006	540 I
.S0053	541 I	.S0007	542 I	.S0054	543 I	.S0055	544 I	.S0056	545 I
.S0057	546 I	.S0040	547 I	.S0041	550 I	.S0042	551 I	.S0043	552 I
.S0044	553 I	.S0045	554 I	.S0046	555 I	.S0047	556 I	.S0030	557 I
.S0031	560 I	.S0032	561 I	.S0033	562 I	.S0034	563 I	.S0035	564 I
.S0036	565 I	.S0037	566 I	.S0020	567 I	.00000	570 I		

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	-	-	-	-	-	-	-	-	-	-
00060	52	54	55	61	33	37	42	44	-	50
00070	137	143	147	150	-	100	111	121	126	133
00080	227	-	242	-	166	171	175	203	211	-
00090	314	324	330	334	255	261	270	271	-	312
00100	376	377	400	404	337	345	351	353	363	372
00110	443	444	450	454	410	411	420	427	436	442
00120	517	522	525	531	455	465	504	506	507	513
00130	600	614	631	632	535	540	546	550	562	574
00140	741	743	752	763	655	701	707	711	723	736
00150	1045	1046	1062	1070	767	773	774	1012	1027	1035
00160	1126	1130	1136	1140	1100	1101	1115	-	1124	1125
00170	1167	1172	1200	1212	1141	1142	1143	1150	1152	1157
00180	1254	1266	1275	1304	1220	1222	1224	1230	1234	1244
00190	1357	1366	1370	1374	1311	1316	1324	1332	1333	1345
00200	-	-	-	-	1376	1412	1414	1420	1422	-
00210	-	1440	-	1442	-	-	-	-	-	1436
00220	1476	1500	-	1513	1445	1447	1453	1455	1470	1472
00230	-	-	1533	1534	1516	1521	1524	1527	-	1531
00240	1572	1601	1615	-	1535	1541	1543	1551	1564	1570
00250	1633	1637	-	1644	-	-	1617	1622	1623	1627
00260	1676	1705	1714	1723	1650	1651	1655	1661	1665	1672
00270	2022	-	2036	-	1724	1744	1764	2004	2005	-
00280	2100	2102	2104	2105	2052	2055	2061	2066	2073	2075
					2115	2120	2127	2130	2134	2144

```
ROTARY  ROTARY.F4        FORTRAN V.5A(563) /KI    6-OCT-77          12:30    PAGE 1-8


00290 ! 2147    2156    2157    2163    2173    2176    2205    2206    2212    2216
00300 ! 2220    2225    2231    2235    2237    *       *       2241    2243    2251
00310 ! *       2255    2257    2260    2261    2262    2263    2264    2267    2270
00320 ! 2271    2272    2273    2277    2300    2303    2304    2305    2311    2312
00330 ! 2315    2316    2317    2323    2325    2333    2340    2346    2356    2360
00340 ! 2365    2366    2370    2373    2400    2401    2403    2406    2410    2412
00350 ! 2417    2421    2427    2430    2432    2434    2442    2443    *       2445

ROTARY  OCTAL PROG SIZE=3367  [ SCALARS/ARRAYS=502 + TEMPS/CONS=100 + CODE=2460 + ARGS=105 ]  + COMMON=14011
[ NO ERRORS DETECTED ]
```

```
00001         SUBROUTINE SCREEN(L,SCSZ,SIZE,NSIZE,NGRAV,FEED,SOVER,FOVER,
00002        1 SUNDER,FUNDER,YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C  THIS PROGRAM DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE
00005    C  SCREEN OVER AND SCREEN UNDER STREAMS FOR A GIVEN FEED.
00006    C
00007    C   VARIABLES AND ARRAYS APPEARING IN THE SUBROUTINE LIST
00008    C     IDRY          * INDICATES IF SCREEN IS WET OR DRY
00009    C                         IDRY=1 FOR DRY SCREEN
00010    C                         IDRY=2 FOR WET SCREEN
00011    C     LEVEL         * INDICATES IF SCREEN IS AN UPPER OR LOWER SCREEN
00012    C                         LEVEL=1 FOR UPPER SCREEN
00013    C                         LEVEL=2 FOR LOWER SCREEN
00014    C     SCSZ          * PROJECTED SCREEN OPENING
00015    C     SIZE(I)       * BOUNDARIES OF COAL SIZE INCREMENTS
00016    C     NSIZE         * NUMBER OF SIZE INCREMENTS
00017    C     NGRAV         * NUMBER OF GRAVITY INCREMENTS
00018    C     FEED(I,J,K)   * PROPERTIES OF FEED STREAM
00019    C     SOVER(I,J,K)  * PROPERTIES OF OVERFLOW STREAM
00020    C     FOVER         * OVERFLOW PRODUCT FLOW RATE                              *
00021    C     SUNDER(I,J,K) * PROPERTIES OF UNDERFLOW STREAM                          *
00022    C     FUNDER        * UNDERFLOW PRODUCT FLOW RATE                             *
00023    C     I             * DESIGNATES SIZE INCREMENT OF COAL                       *
00024    C     J             * DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL           *
00025    C     K             * DESIGNATES WEIGHT, ASH, PYRITIC SULPHUR AND TOTAL SULPHUR
00026    C                     (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE
00027    C                     STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)
00028    C     SYLD(I)       * PERCENT OF FEED OF THE ITH SIZE
00029    C                     REPORTING TO THE UNDERFLOW STREAM
00030    C ***************************************************************************
00031         COMMON A(9,2,2),C(23),SMID(23),AC(13)                                  * DIM *
00032         DIMENSION SSZ(13),D1(9),D2(9),D3(9),D4(9)                              * DIM *
00033         DIMENSION SIZE(23),FEED(23,10,4),SUNDER(23,10,4),BTU(4)                * DIM *
00034        1,SOVER(23,10,4)                                                        * DIM *
00035         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMD(24,5),SREF(24,5),              * DIM *
00036        1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24),      * DIM *
00037        2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),       * DIM *
00038        3              SPE(24),SIMP(24),SEA(24)                                * DIM *
00039         DATA SSZ / 18.,6.,6.,1.5,.375,.25,.093,.0232,.0164,.0116,4*0./         * DIM *
00040         DATA D1 /60.,20.,8.,8.,5.,3.,0.7,0.6,0.5/                              * DIM *
00041         DATA D2 /60.,20.,8.,6.,4.,2.,0.7,0.6,0.5/                              * DIM *
00042         DATA D3 / 60.,20.,9.,8.6,5.5,3.5,0.8,0.7,0.55 /                        * DIM *
00043         DATA D4 /60.,20.,9.,6.6,4.5,2.3,0.8,0.7,0.55 /                         * DIM *
00044         NS=NSIZE+1
00045         IDRY=1
00046         LEVEL=1
00047         IF ((L.EQ.23).OR.(L.EQ.24)) IDRY=2
00048         IF ((L.EQ.22).OR.(L.EQ.24)) LEVEL=2
00049         FOVER=0.0
00050         FUNDER=0.0
00051         DO 7 I=1,9                                                             * DIM *
00052         A(I,1,1)=D1(I)
00053         A(I,1,2)=D2(I)
00054         A(I,2,1)=D3(I)
00055         A(I,2,2)=D4(I)
00056       7 AC(I)=A(I,IDRY,LEVEL)
```

```
00057          CALL INTS(SSZ,AC,SCSZ,AA,9)                                    * DIM *
00058          DO 1 I=1,NSIZE
00059          SMID(I)=(SIZE(I)+SIZE(I+1))/2.0
00060          FRAC1=1.0
00061          FRAC2=1.0
00062          C1=0.0
00063          C2=0.0
00064          IF(SIZE(I)-SCSZ) 2,2,3
00065        3 C1=1.0
00066          IF(SIZE(I+1)-SCSZ) 11,10,10
00067       11 FRAC1=(SIZE(I)-SCSZ)/ (SIZE(I)-SIZE(I+1))
00068          FRAC2=1.0-FRAC1
00069          SMID(I)=(SCSZ+SIZE(I+1))/2.
00070        2 C2=1./EXP(AA*(1.-SMID(I)/SCSZ))
00071       10 C(I)=C1*FRAC1+C2*FRAC2
00072        1 CONTINUE
00073          DO 4 I=1,NSIZE
00074          DO 4 J=1,NGRAV
00075          SOVER(I,J,1)=C(I)*FEED(I,J,1)
00076          SUNDER(I,J,1)=FEED(I,J,1)-SOVER(I,J,1)
00077          FOVER=SOVER(I,J,1)+FOVER
00078          FUNDER=SUNDER(I,J,1)+FUNDER
00079          DO 4 K=2,4                                                     * DIM *
00080          SOVER(I,J,K)=FEED(I,J,K)
00081          SUNDER(I,J,K)=FEED(I,J,K)
00082        4 CONTINUE
00083    C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00084          DO 12 I=1,NSIZE
00085          DO 12 J=1,NGRAV
00086          SOVER(I,J,1)=SOVER(I,J,1)/FOVER
00087          SUNDER(I,J,1)=SUNDER(I,J,1)/FUNDER
00088          DO 12 K=2,4                                                    * DIM *
00089          IF (SOVER(I,J,1).EQ.0.) SOVER(I,J,K)=0.
00090          IF (SUNDER(I,J,1).EQ.0.) SUNDER(I,J,K)=0.
00091       12 CONTINUE
00092          IF (KBSG.EQ.0) RETURN
00093    C*****************************************************************************
00094    C CALCULATE SUMMARY DATA BY SIZE INCREMENTS                                  *
00095    C*****************************************************************************
00096          CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00097          CALL SDSIZE(SOVER,SCC,BTU,NSIZE,NGRAV)
00098          CALL SDSIZE(SUNDER,SREF,BTU,NSIZE,NGRAV)
00099    C CALCULATE WEIGHT AND BTU UNDERFLOW-TO-FEED RATIOS
00100          DO 40 I=1,NSIZE
00101          SYLD(I)=100.*(1.-C(I))
00102          BTUREC(I)=100.*FUNDER*SREF(I,1)*SREF(I,5)/(SFEED(I,1)*SFEED(I,5))
00103       40 CONTINUE
00104          SYLD(NS)=100.*FUNDER
00105          BTUREC(NS)=100.*FUNDER*SREF(NS,1)*SREF(NS,5)/(SFEED(NS,1)*SFEED(NS
00106         1 ,5))
00107    C  CALCULATE UNDERSIZE IN OVERFLOW AND OVERSIZE IN UNDERFLOW
00108          DO 45 I=1,NS
00109          SFLT(I)=0.
00110       45 SINK(I)=0.
00111          DO 65 I=1,NSIZE
00112          IF (SIZE(I+1)-SCSZ) 50,55,55
```

```
00113        50 SFLT(I)=SCC(I,1)
00114           GO TO 60
00115        55 SINK(I)=SREF(I,1)
00116        60 SFLT(NS)=SFLT(NS)+SFLT(I)
00117           SINK(NS)=SINK(NS)+SINK(I)
00118        65 CONTINUE
00119           RETURN
00120           END
```

COMMON BLOCKS

/.COMM./(+137)

A	+0#R	C	+44#R	SMID	+73#R	AC	+122#R		

/BLK1/(+1430)

SFEED	+0#R	SCC	+170#R						
SMD	+360#R	SREF	+550#R	SYLD	+740#R	TYLD	+770#R	EFFIC	+1020#R
BTUREC	+1050#R	ASHERR	+1100#R	SFLT	+1130#R	SINK	+1160#R	SMISPL	+1210#R
SNRGR	+1240#R	SGRAV	+1270#R	SPE	+1320#R	SIMP	+1350#R	SEA	+1400#R

SUBPROGRAMS CALLED

INTS SDSIZE EXP.

SCALARS AND ARRAYS ("*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED)

D4	1#R	SOVER	12#R	*NS	13 I	FEED	14#R	*K	15 I
D3	16#R	%YLDVSL		*LEVEL	27 I	D2	30#R	*KBSG	41 I
*FUNDER	42 R	%BTUVSL		*FRAC2	43 R	*FOVER	44 R	*J	45 I
D1	46#R	SSZ	57#R	*SCSZ	74 R	*FRAC1	75 R	*NSIZE	76 I
SIZE	77#R	*C2	100 R	*AA	101 R	*IDRY	102 I	BTU	103#R
*L	104 I	*I	105 I	*C1	106 R	*NGRAV	107 I	SUNDER	110#R

TEMPORARIES

.S0010	111 I	.S0011	112 I	.S0012	113 I	.S0000	114 I	.S0001	115 I
.S0002	116 I	.S0003	117 I	.S0004	120 I	.S0005	121 I	.A0016	122 R
.S0006	123 I	.S0007	124 I	.00000	125 I				

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	54	55	56	60	31 62	32 64	36 66	37 100	45 102	53 104

```
SCREEN  SCREN1.F4        FORTRAN V.5A(563) /KI    6-OCT-77          12:31   PAGE 1-3

00060 ! 112     114     115     116     117     124     126     133     143     146
00070 ! 154     166     174     176     202     206     220     234     242     250
00080 ! 251     265     301     -       310     314     320     326     335     336
00090 ! 354     373     402     -       -       -       404     406     410     -
00100 ! 412     414     420     430     432     436     -       -       446     450
00110 ! 451     454     456     463     465     466     470     473     475     -
00120 ! 477

SCREEN  OCTAL PROG SIZE=677  [ SCALARS/ARRAYS=110 + TEMPS/CONS=21 + CODE=514 + ARGS=32 ]  + COMMON=1567
[ NO ERRORS DETECTED ]
```

```
SDSIZE  SDSIZ1.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:53   PAGE 1

00001          SUBROUTINE SDSIZE(FLOW,SUM,BTU,NSIZE,NGRAV)
00002          DIMENSION FLOW(23,10,4),SUM(24,5),BTU(4)
00003          NS=NSIZE+1
00004          DO 10 K=1,5
00005          SUM(NS,K)=0.                                                    * DIM *
00006     10   CONTINUE
00007     C CALCULATE COMPOSITION OF FLOW STREAMS BY SIZE INCREMENTS
00008          DO 35 I=1,NSIZE
00009          DO 15 K=1,5
00010          SUM(I,K)=0.                                                     * DIM *
00011     15   CONTINUE
00012          DO 21 J=1,NGRAV
00013          SUM(I,1)=SUM(I,1)+100.*FLOW(I,J,1)
00014          DO 20 K=2,4
00015          SUM(I,K)=SUM(I,K)+100.*FLOW(I,J,1)*FLOW(I,J,K)                  * DIM *
00016       20 CONTINUE
00017          SUM(I,5)=SUM(I,5)+100.*FLOW(I,J,1)*RTUPLB(BTU,
00018         1 FLOW(I,J,2))
00019       21 CONTINUE
00020          IF (SUM(I,1).GT.0.) SUM(I,5)=SUM(I,5)/SUM(I,1)
00021          SUM(NS,1)=SUM(NS,1)+SUM(I,1)
00022          DO 35 K=2,4
00023          SUM(NS,K)=SUM(NS,K)+SUM(I,K)                                    * DIM *
00024          IF (SUM(I,1).EQ.0.) GO TO 22
00025          SUM(I,K)=100.*SUM(I,K)/SUM(I,1)
00026          GO TO 35
00027       22 SUM(I,K)=0.
00028       35 CONTINUE
00029          DO 36 I=1,NSIZE
00030          IF (SUM(NS,1).GT.0.) SUM(NS,5)=SUM(NS,5)+SUM(I,1)*
00031         1 SUM(I,5)/SUM(NS,1)
00032       36 CONTINUE
00033          RETURN
00034          END

SUBPROGRAMS CALLED

RTUPLB

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*NS          1 I        *K          2 I        *J          3 I        SUM         4#R        *NSIZE      5 I
 BTU         6#R         FLOW       7#R        *I         10 I        *NGRAV     11 I

TEMPORARIES

 .S0000     12 I        .S0001     13 I        .S0002     14 I        .S0003     15 I        .S0004      16 I
 .S0005     17 I        .A0016     20 R        .S0006     21 I        .Q0000     22 I
```

```
SDSIZE  SDSIZ1.F4        FORTRAN V.5A(563) /KI   6-OCT-77          12:53   PAGE 1-1


LINE NUMBER/OCTAL LOCATION MAP

       : 0       1       2       3       4       5       6       7       8       9
-------:-------------------------------------------------------------------------------
       :
00000  : -       0       -       13      16      17      24      -       25      31
00010  : 32      37      40      44      54      55      76      77      -       115
00020  : 120     131     137     140     152     156     170     171     176     202
00030  : 204     -       220     -       222

SDSIZE  OCTAL PROG SIZE=255  [ SCALARS/ARRAYS=11 + TEMPS/CONS=14 + CODE=225 + ARGS=3 ]
[ NO ERRORS DETECTED ]


END       USER: BAUGHMAN [10,110021]          JOB: MAIN1   SEQ: 11933   FINISHED: 06-OCT-77 13:36  PAGES: 94  SYSTEM: 8          END
*************************************************************************************************************************************
```

```
00001         SUBROUTINE SEP(FEED,CC,REF,MID,SIZE,GRAV,GBOUND,SGXX,YLDCC,YLDMID,
00002        1 YLDREF,NSIZE,NGRAV,LV,NCOMP,YLDVSL,BTUVSL,BTU,KBSG)
00003    C ***************************************************************************
00004    C THIS SUBROUTINE DETERMINES THE WEIGHT DISTRIBUTION AND COMPOSITION OF THE    *
00005    C CLEAN COAL AND THE REFUSE FOR A GIVEN FEED ENTERING A SPECIFIED VESSEL       *
00006    C AT A GIVEN OVERALL SEPARATION GRAVITY                                        *
00007    C                                                                              *
00008    C PRINCIPAL ARRAYS AND VARIABLES                                               *
00009    C                                                                              *
00010    C FLOW STREAMS                                                                 *
00011    C     FEED(I,J,K) = PROPERTIES OF THE FEED STREAM                              *
00012    C     CC(I,J,K)   = PROPERTIES OF THE CLEAN COAL                               *
00013    C     REF(I,J,K)  = PROPERTIES OF THE REFUSE                                   *
00014    C     MID(I,J,K)  = PROPERTIES OF THE MIDDLINGS (JIG ONLY)                     *
00015    C     SIZE(I)     = BOUNDARIES OF COAL SIZE INCREMENTS                         *
00016    C     GBOUND(J)   = BOUNDARIES OF SPECIFIC GRAVITY INCREMENTS                  *
00017    C     GRAV(J)     = SPECIFIC GRAVITIES                                         *
00018    C     I           = DESIGNATES SIZE INCREMENT OF COAL                          *
00019    C     J           = DESIGNATES SPECIFIC GRAVITY INCREMENT OF COAL              *
00020    C     K           = DESIGNATES WEIGHT, ASH, PYRITIC SULFUR AND TOTAL SULFUR    *
00021    C                     (THE WEIGHT COLUMN CONTAINS THE FRACTION OF THE ENTIRE    *
00022    C                     STREAM IN THE ITH SIZE, JTH GRAVITY INCREMENT)           *
00023    C     NSIZE       = NUMBER OF SIZE INCREMENTS OF COAL                          *
00024    C     NGRAV       = NUMBER OF SPECIFIC GRAVITY INCREMENTS OF COAL              *
00025    C                                                                              *
00026    C GENERAL                                                                      *
00027    C     R(I1,L)  = RATIO OF SEPARATION GRAVITY FOR A GIVEN SIZE DESIGNATION TO   *
00028    C                THE OVERALL SEPARATION GRAVITY                                *
00029    C     S(I1,L)  = BOUNDARIES OF SEPARATION CURVE SIZE INCREMENTS                *
00030    C     N(L)     = NUMBER OF SIZES FOR EACH VESSEL                               *
00031    C     I1       = DESIGNATES SIZE INCREMENT OF SEPARATION CURVE                 *
00032    C     L        = DESIGNATES TYPE OF VESSEL                                     *
00033    C                  L=1 FOR CONCENTRATING TABLE                                 *
00034    C                  L=2 FOR DENSE-MEDIUM VESSEL                                 *
00035    C                  L=3 FOR DENSE-MEDIUM CYCLONE                                *
00036    C                  L=4 FOR HYDROCYCLONE                                        *
00037    C                  L=5 FOR SINGLE-STAGE BAUM JIG                               *
00038    C                  L=6 AND L=7 FOR 2-STAGE BAUM JIG                            *
00039    C                  L=8 FOR FROTH FLOTATION CELL                                *
00040    C     SGSP     = OVERALL SEPARATION GRAVITY                                    *
00041    C     YIELD    = WEIGHT FRACTION OF FEED TO CLEAN COAL                         *
00042    C ***************************************************************************
00043    C
00044    C                                                                              *
00045    C ***************************************************************************
00046    C
00047    C NOTE: THE CURRENT VERSION OF THE SIMULATOR DOES NOT USE THIS SUBROUTINE      *
00048    C       FOR FROTH FLOTATION CALCULATIONS (SEE SUBROUTINE FROTH)                *
00049    C                                                                              *
00050    C ***************************************************************************
00051         DIMENSION FEED(23,10,4),CC(23,10,4),REF(23,10,4),MID(23,10,4),     * DIM *
00052        1          SIZE(23),GRAV(10),GBOUND(11),BTU(4)                     * DIM *
00053         COMMON    XFEED(10,10),XCC(10,10),XMID(10,10),SCMNT(20),SCMASH(20)* DIM *
00054         DIMENSION R(10,8),S(10,8)                                         * DIM *
00055         COMMON                    FACTOR(10),N(8)                         * DIM *
00056         COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),        * DIM *
```

```
00057        1              SYLD(24),TYLD(24),EFFIC(24),STUREC(24),ASHERR(24),   * DIM *
00058        2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),    * DIM *
00059        3              SPE(24),SIMP(24),SEA(24)                             * DIM *
00060         COMMON /BLK2/ DISTRB(24,10)                                        * DIM *
00061         REAL MID
00062    C *** A CHANGE IN THE SIZE OF N WILL AFFECT THE FOLLOWING CARD          * DIM *
00063         DATA N / 8,6,7,8,8,5,8,2 /
00064    C *** A CHANGE IN THE SIZE OF R WILL AFFECT THE FOLLOWING 8 CARDS       * DIM *
00065         DATA R / .988,.994,.974,.970,1.028,1.128,1.212,1.,2*0.,            TABLES
00066        1 .969,.981,.993,1.01,1.031,1.,4*0.,                               DMV
00067        2 .995,.989,.991,.999,1.019,1.042,1.,3*0.,                         DMC
00068        3 .810,.842,.861,.956,1.074,1.199,1.362,1.,2*0.,                   HC
00069        4 .940,.953,1.007,1.081,1.040,1.081,1.302,1.,2*0.,                 JIG-OV
00070        5 1.074,1.094,1.161,1.282,1.262,5*0.,                              JIG-PR
00071        6 .946,.966,1.047,1.134,1.060,1.107,1.336,1.047,2*0.,              JIG-SEC
00072        7 1.,1.,8*0. /                                                     FF
00073    C *** A CHANGE IN THE SIZE OF S WILL AFFECT THE FOLLOWING 8 CARDS       * DIM *
00074         DATA S / 100.,.25,.093,.046,.0232,.0116,.0058,3*0.,                TABLES
00075        1 100.,4.,2.,1.,.5,5*0.,                                           DMV
00076        2 100.,.5,.375,.25,.093,.046,4*0.,                                 DMC
00077        3 100.,.185,.093,.046,.0232,.0116,.0058,3*0.,                      HC
00078        4 100.,3.,1.625,.5,.25,.093,.046,3*0.,                             JIG-OV
00079        5 100.,3.,1.625,.5,6*0.,                                           JIG-PR
00080        6 100.,3.,1.625,.5,.25,.093,.046,3*0.,                             JIG-SEC
00081        7 100.,9*0. /                                                      FF
00082         L=LV
00083         SGSP=SGXX
00084         KCOUNT=1
00085         IF (LV.EQ.6) L=5
00086         IF (LV.NE.7) GO TO 100
00087         L=R
00088         SGSP=1.5
00089     100 NS=NSIZE+1
00090         NG=NGRAV+1
00091    C TEST FOR COMPOSITE FEED
00092     1000 IF (NCOMP.NE.0) GO TO 40
00093    C ***************************************************************************
00094    C TRANSFORM FROM WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF FEED      *
00095    C TO WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF SEPARATION CURVES     *
00096    C ***************************************************************************
00097         DO 1 I1=1,10                                                       * DIM *
00098         DO 1 J=1,10                                                        * DIM *
00099         XFEED(I1,J)=0.
00100         XCC(I1,J)=0.
00101       1 XMID(I1,J)=0.
00102         NF=N(L)-1
00103         DO 18 I1=1,NF
00104    C FIND SMALLEST SIZE(I) THAT IS GREATER THAN OR EQUAL TO S(I1,L)
00105         DO 2 I=1,NS
00106         IF (SIZE(I).GT.S(I1,L)) GO TO 2
00107         IMIN=I-1
00108         IF (SIZE(I).EQ.S(I1,L)) IMIN=I
00109         GO TO 3
00110       2 CONTINUE
00111         IMIN=NS
00112       3 IF ((IMIN.EQ.0).AND.(SIZE(1).LE.S(I1+1,L))) GO TO 18
```

```
00113          IF (IMIN.EQ.NS) GO TO 16
00114    C FIND LARGEST SIZE(I) THAT IS LESS THAN OR EQUAL TO S(I1+1,L)
00115          DO 4 I=1,NS
00116          IF (SIZE(I).GT.S(I1+1,L)) GO TO 4
00117          IMAX=I
00118          GO TO 5
00119        4 CONTINUE
00120          IMAX=NS+1
00121        5 IF ((IMAX.EQ.NS+1).AND.(SIZE(NS).GE.S(I1,L))) GO TO 16
00122          IF (IMAX.EQ.1) GO TO 16
00123    C DETERMINE NUMBER OF INTERVALS ENTIRELY WITHIN S(I1,L) AND S(I1+1,L)
00124          NINT=IMAX-IMIN-2
00125          IF (NINT.LT.0) NINT=0
00126    C CARRY OUT TRANSFORMATION
00127          DO 17 J=1,NGRAV
00128          IF ((IMIN.EQ.0).AND.(IMAX.LT.NS+1)) GO TO 6
00129          IF ((IMIN.GT.0).AND.(IMAX.EQ.NS+1)) GO TO 11
00130          IF ((IMIN.EQ.0).AND.(IMAX.EQ.NS+1)) GO TO 14
00131    C CASE 1 - SIZE(IMIN) .GE. S(I1,L) AND SIZE(IMAX) .LE. S(I1+1,L)
00132          IF (IMAX-IMIN.GT.1) GO TO 6
00133          XFEED(I1,J)=FEED(IMIN,J,1)*(S(I1+1,L)-S(I1,L))/(SIZE(IMAX)-
00134         1 SIZE(IMIN))
00135          GO TO 17
00136        6 XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMIN+1)-S(I1,L))/(SIZE(IMIN+1)-
00137         1 SIZE(IMIN))+FEED(IMAX-1,J,1)*(S(I1+1,L)-SIZE(IMAX-1))/
00138         2 (SIZE(IMAX)-SIZE(IMAX-1))
00139          IF (NINT.EQ.0) GO TO 17
00140          DO 7 II=1,NINT
00141          IJ=IMIN+II
00142        7 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00143          GO TO 17
00144    C CASE 2 - LEFT BOUNDARY .LT. S(I1,L)          (IMIN=0)
00145        8 IF (NINT.GT.0) GO TO 9
00146          XFEED(I1,J)=FEED(IMIN+1,J,1)*(S(I1+1,L)-SIZE(IMIN+1))/(SIZE(IMAX)-
00147         1 SIZE(IMIN+1))
00148          GO TO 17
00149        9 XFEED(I1,J)=FEED(IMIN+1,J,1)+FEED(IMAX-1,J,1)*(S(I1+1,L)-
00150         1 SIZE(IMAX-1))/(SIZE(IMAX)-SIZE(IMAX-1))
00151          IF (NINT.EQ.1) GO TO 17
00152          DO 10 II=2,NINT
00153          IJ=IMIN+II
00154       10 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00155          GO TO 17
00156    C CASE 3 - RIGHT BOUNDARY .GT. S(I1+1,L)      (IMAX=NSIZE+1)
00157       11 IF (NINT.GT.0) GO TO 12
00158          XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMAX-1)-S(I1,L))/(SIZE(IMAX-1)-
00159         1 SIZE(IMIN))
00160          GO TO 17
00161       12 XFEED(I1,J)=FEED(IMIN,J,1)*(SIZE(IMIN+1)-S(I1,L))/(SIZE(IMIN+1)-
00162         1 SIZE(IMIN))+FEED(IMAX-2,J,1)
00163          IF (NINT.EQ.1) GO TO 17
00164          NJNT=NINT-1
00165          DO 13 II=1,NJNT
00166          IJ=IMIN+II
00167       13 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00168          GO TO 17
```

```
00169   C CASE 4 = LEFT BOUNDARY .LT. S(I1,L) AND RIGHT BOUNDARY .GT. S(I1+1,L)
00170   C                                                (IMIN=0 AND IMAX=NSIZE+1)
00171      14 IF (NINT.GT.1) GO TO 15
00172         XFEED(I1,J)=FEED(IMIN+1,J,1)
00173         GO TO 17
00174      15 XFEED(I1,J)=FEED(IMIN+1,J,1)+FEED(IMAX-2,J,1)
00175         IF (NINT.EQ.2) GO TO 17
00176         NJNT=NINT-1
00177         DO 16 II=2,NJNT
00178         IJ=IMIN+II
00179      16 XFEED(I1,J)=XFEED(I1,J)+FEED(IJ,J,1)
00180      17 CONTINUE
00181      18 CONTINUE
00182   C ***************************************************************************
00183   C CARRY OUT SEPARATION                                                      *
00184   C ***************************************************************************
00185         DO 19 I1=1,NF
00186         IX=I1
00187         DO 19 J=1,NGRAV
00188         X=GRAV(J)/(R(I1,L)*SGSP)
00189         XCC(I1,J)=Y(X,L,IX)*XFEED(I1,J)
00190      19 CONTINUE
00191         IF (LV.NE.6) GO TO 23
00192   C SPECIAL PROVISION FOR 2-STAGE BAUM JIG
00193      20 NF1=N(6)-1
00194         NF2=N(7)-1
00195         DO 22 I1=1,NF2
00196         IX=I1
00197         DO 22 J=1,NGRAV
00198         Y1=1.
00199         IF (I1.GT.NF1) GO TO 21
00200         X=GRAV(J)/(R(I1,6)*SGSP)
00201         Y1=Y(X,6,IX)
00202      21 FF=Y1*XFEED(I1,J)
00203         X=GRAV(J)/(R(I1,7)*SGSP)
00204      22 XMID(I1,J)=(1.-Y(X,7,IX))*FF
00205   C ***************************************************************************
00206   C TRANSFORM FROM WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF SEPARATION  *
00207   C CURVES TO WEIGHT DISTRIBUTION BASED UPON SIZE INCREMENTS OF CLEAN COAL       *
00208   C ***************************************************************************
00209      23 NL=N(L)
00210         DO 24 I=1,23                                                    * DIM *
00211         DO 24 J=1,10                                                    * DIM *
00212         CC(I,J,1)=0.
00213         MID(I,J,1)=0.
00214      24 REF(I,J,1)=0.
00215         DO 32 I=1,NSIZE
00216   C FIND SMALLEST S(I1,L) THAT IS GREATER THAN OR EQUAL TO SIZE(I)
00217         DO 25 I1=1,NL
00218         IF (S(I1,L).GT.SIZE(I)) GO TO 25
00219         IMIN=I1-1
00220         IF (S(I1,L).EQ.SIZE(I)) IMIN=I1
00221         GO TO 26
00222      25 CONTINUE
00223         IMIN=NL
00224      26 IF ((IMIN.EQ.0).AND.(S(1,L).LE.SIZE(I+1))) GO TO 32
```

```
00225          IF (IMIN.EQ.NL) GO TO 32
00226    C FIND LARGEST S(I1,L) THAT IS LESS THAN OR EQUAL TO SIZE(I+1)
00227          DO 27 I1=1,NL
00228          IF (S(I1,L).GT.SIZE(I+1)) GO TO 27
00229          IMAX=I1
00230          GO TO 28
00231       27 CONTINUE
00232          IMAX=NL+1
00233       28 IF ((IMAX.EQ.NL+1).AND.(S(NL,L).GE.SIZE(I))) GO TO 32
00234          IF (IMAX.EQ.1) GO TO 32
00235    C DETERMINE NUMBER OF INTERVALS ENTIRELY WITHIN SIZE(I) AND SIZE(I+1)
00236          NINT=IMAX-IMIN-2
00237          IF (NINT.LT.0) NINT=0
00238    C CARRY OUT TRANSFORMATION
00239          IF ((IMIN.EQ.0).AND.(IMAX.LT.NL+1)) GO TO 32
00240          IF ((IMIN.GT.0).AND.(IMAX.EQ.NL+1)) GO TO 32
00241          IF ((IMIN.EQ.0).AND.(IMAX.EQ.NL+1)) GO TO 32
00242          DO 31 J=1,NGRAV
00243          IF (IMAX-IMIN.GT.1) GO TO 29
00244          CC(I,J,1)=FEED(I,J,1)*XCC(IMIN,J)/XFEED(IMIN,J)
00245          MID(I,J,1)=FEED(I,J,1)*XMID(IMIN,J)/XFEED(IMIN,J)
00246          GO TO 31
00247       29 F1=(S(IMIN+1,L)-SIZE(I))/(SIZE(I+1)-SIZE(I))
00248          F2=(SIZE(I+1)-S(IMAX-1,L))/(SIZE(I+1)-SIZE(I))
00249          CC(I,J,1)=FEED(I,J,1)*(F1*XCC(IMIN,J)/XFEED(IMIN,J)+
00250         1 F2*XCC(IMAX-1,J)/XFEED(IMAX-1,J))
00251          MID(I,J,1)=FEED(I,J,1)*(F1*XMID(IMIN,J)/XFEED(IMIN,J)+
00252         1 F2*XMID(IMAX-1,J)/XFEED(IMAX-1,J))
00253          IF (NINT.EQ.0) GO TO 31
00254          DO 30 II=1,NINT
00255          IJ=IMIN+II
00256          F3=(S(IJ+1,L)-S(IJ,L))/(SIZE(I+1)-SIZE(I))
00257          CC(I,J,1)=CC(I,J,1)+FEED(I,J,1)*F3*XCC(IJ,J)/XFEED(IJ,J)
00258          MID(I,J,1)=MID(I,J,1)+FEED(I,J,1)*F3*XMID(IJ,J)/XFEED(IJ,J)
00259       30 CONTINUE
00260       31 CONTINUE
00261       32 CONTINUE
00262          GO TO 44
00263    C ***************************************************************************************
00264    C COMPOSITE SEPARATION
00265    C ***************************************************************************************
00266       40 NL=N(L)                                                                          *
00267          DO 420 I=1,23                                                                    *
00268          DO 420 J=1,10                                                                    *
00269      420 MID(I,J,1)=0.                                                          * DIM *    *
00270          DO 41 J=1,NGRAV                                                        * DIM *    *
00271          X=GRAV(J)/SGSP                                                                   *
00272       41 CC(1,J,1)=Y(X,L,NL)*FEED(1,J,1)                                                  *
00273          IF (LV.NE.6) GO TO 44                                                            *
00274    C SPECIAL PROVISION FOR 2-STAGE BAUM JIG                                               *
00275       42 DO 43 J=1,NGRAV                                                                  *
00276          X1=GRAV(J)/(R(5,6)*SGSP)                                                         *
00277          FF=Y(X1,6,5)*FEED(1,J,1)                                                         *
00278          X2=GRAV(J)/(R(8,7)*SGSP)                                                         *
00279          MID(1,J,1)=(1.-Y(X2,7,8))*FF                                                     *
00280       43 CONTINUE
```

```
00281   C ***************************************************************************************
00282   C CALCULATE DISTRIBUTION DATA, ASH AND SULFUR CONCENTRATIONS, YIELD,                     *
00283   C SEPARATION GRAVITY, PROBABLE ERROR AND IMPERFECTION                                    *
00284   C ***************************************************************************************
00285      44 SUM1=0.
00286         SUM2=0.
00287         SUM3=0.
00288         DO 45 I=1,NSIZE
00289         DO 45 J=1,NGRAV
00290         REF(I,J,1)=FEED(I,J,1)-CC(I,J,1)-MID(I,J,1)
00291         IF (REF(I,J,1).LT.0.) REF(I,J,1)=0.
00292         SUM1=SUM1+CC(I,J,1)
00293         SUM2=SUM2+REF(I,J,1)
00294         SUM3=SUM3+MID(I,J,1)
00295         DISTRB(I,J)=100.*CC(I,J,1)/FEED(I,J,1)
00296         IF (DISTRB(I,J).GT.100.) DISTRB(I,J)=100.
00297         IF (DISTRB(I,J).LT.0.) DISTRB(I,J)=0.
00298         DO 45 K=2,4                                                          * DIM *
00299         CC(I,J,K)=FEED(I,J,K)
00300         REF(I,J,K)=FEED(I,J,K)
00301         MID(I,J,K)=FEED(I,J,K)
00302      45 CONTINUE
00303         DO 411 I=1,NSIZE
00304         DO 410 J=1,NGRAV
00305     410 FACTOR(J)=100.-DISTRB(I,J)
00306         SGRAV(I)=YINTRP(FACTOR,GRAV,50.,NGRAV)
00307         SX1=YINTRP(FACTOR,GRAV,75.,NGRAV)
00308         SX2=YINTRP(FACTOR,GRAV,25.,NGRAV)
00309         SPE(I)=(SX1-SX2)/2.
00310         IF (FACTOR(NGRAV).LT.75.) SPE(I)=SGRAV(I)-SX2
00311         SIMP(I)=SPE(I)/(SGRAV(I)-1.)
00312         IF ((L.EQ.2).OR.(L.EQ.3)) SIMP(I)=SPE(I)/SGRAV(I)
00313     411 CONTINUE
00314         DO 440 J=1,NGRAV
00315         DISTRB(NS,J)=0.0
00316         SUM4=0.0
00317         DO 430 I=1,NSIZE
00318         DISTRB(NS,J)=DISTRB(NS,J)+CC(I,J,1)
00319     430 SUM4=SUM4+FEED(I,J,1)
00320         DISTRB(NS,J)=100.*DISTRB(NS,J)/SUM4
00321         IF (DISTRB(NS,J).GT.100.) DISTRB(NS,J)=100.
00322         IF (DISTRB(NS,J).LT.0.) DISTRB(NS,J)=0.
00323     440 CONTINUE
00324         DO 441 J=1,NGRAV
00325     441 FACTOR(J)=100.-DISTRB(NS,J)
00326         SGRAV(NS)=YINTRP(FACTOR,GRAV,50.,NGRAV)
00327         SX1=YINTRP(FACTOR,GRAV,75.,NGRAV)
00328         SX2=YINTRP(FACTOR,GRAV,25.,NGRAV)
00329         SPE(NS)=(SX1-SX2)/2.
00330         IF (FACTOR(NGRAV).LT.75.) SPE(NS)=SGRAV(NS)-SX2
00331         SIMP(NS)=SPE(NS)/(SGRAV(NS)-1.)
00332         IF ((L.EQ.2).OR.(L.EQ.3)) SIMP(NS)=SPE(NS)/SGRAV(NS)
00333         YLDCC=SUM1
00334         YLDREF=SUM2
00335         YLDMID=SUM3
00336   C CONVERGENCE TEST FOR OVERALL SPECIFIC GRAVITY OF SEPARATION
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```
00337         IF(ABS(SGXX-SGRAV(NS)).LE. 0.003) GO TO 454
00338         IF ((KCOUNT.EQ.20).OR.(L.EQ.8)) GO TO 454
00339         SGSP=SGSP+(KCOUNT/10)*(SGXX-SGRAV(NS))
00340         KCOUNT = KCOUNT +1
00341         GO TO 1000
00342   C NORMALIZE WEIGHT FRACTIONS IN EXIT STREAMS
00343     454 DO 46 I=1,NSIZE
00344         DO 46 J=1,NGRAV
00345         CC(I,J,1)=CC(I,J,1)/SUM1
00346         REF(I,J,1)=REF(I,J,1)/SUM2
00347         IF (SUM3.EQ.0.) GO TO 46
00348         MID(I,J,1)=MID(I,J,1)/SUM3
00349      46 CONTINUE
00350   C  DEBUG STATEMENTS
00351         WRITE(6,999) KCOUNT,SGXX,SGSP,SGRAV(NS)                          * DEBUG *
00352   999   FORMAT(1H0,5X,'KCOUNT= ',I2,5X,'SGXX= ',F5.3,5X                  * DEBUG *
00353        1,'SGSP= ',F5.3,5X,'SGRAV(NS)= ',F5.3)                           * DEBUG *
00354         IF (KBUG.EQ.0) RETURN                                            * DEBUG *
00355   C ***************************************************************************
00356   C CALCULATE SUMMARY DATA BY SIZE INCREMENTS                                *
00357   C ***************************************************************************
00358         CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00359         CALL SDSIZE(CC,SCC,BTU,NSIZE,NGRAV)
00360         CALL SDSIZE(REF,SREF,BTU,NSIZE,NGRAV)
00361         CALL SDSIZE(MID,SMID,BTU,NSIZE,NGRAV)
00362         DO 490 I=1,NSIZE
00363         SYLD(I)=100.*SUM1*SCC(I,1)/SFEED(I,1)
00364     490 CONTINUE
00365         SYLD(NS)=100.*YLDCC
00366   C CALCULATE THEORETICAL RECOVERY, WEIGHT EFFICIENCY, BTU RECOVERY AND
00367   C ASH ERROR
00368         DO 51 I=1,NSIZE
00369         SCMWT(1)=0.
00370         SCMASH(1)=0.
00371         DO 500 J=2,NG
00372         J1=J-1
00373         SCMWT(J)=0.
00374         SCMASH(J)=0.
00375         DO 50 K=1,J1
00376         SCMWT(J)=SCMWT(J)+1.E+4*FEED(I,K,1)/SFEED(I,1)
00377      50 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00378         SCMASH(J)=1.E+4*SCMASH(J)/(SCMWT(J)*SFEED(I,1))
00379         IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00380     500 CONTINUE
00381         TYLD(I)=YINTRP(SCMASH,SCMWT,SCC(I,2),NG)
00382         IF (TYLD(I).GT.0.) EFFIC(I)=100.*SYLD(I)/TYLD(I)
00383         BTUREC(I)=100.*YLDCC*SCC(I,1)*SCC(I,5)/(SFEED(I,1)*SFEED(I,5))
00384         ASHERR(I)=SCC(I,2)-YINTRP(SCMWT,SCMASH,SYLD(I),NG)
00385      51 CONTINUE
00386         SCMWT(1)=0.
00387         SCMASH(1)=0.
00388         DO 520 J=2,NG
00389         J1=J-1
00390         SCMWT(J)=0.
00391         SCMASH(J)=0.
00392         DO 52 K=1,J1
```

```
00393          DO 52 I=1,NSIZE
00394          SCMWT(J)=SCMWT(J)+100.*FEED(I,K,1)
00395       52 SCMASH(J)=SCMASH(J)+100.*FEED(I,K,1)*FEED(I,K,2)
00396          SCMASH(J)=100.*SCMASH(J)/SCMWT(J)
00397          IF (SCMASH(J).LT.SCMASH(J-1)) SCMASH(J)=SCMASH(J-1)
00398      520 CONTINUE
00399          TYLD(NS)=YINTRP(SCMASH,SCMWT,SCC(NS,2),NG)
00400          IF (TYLD(NS).GT.0.) EFFIC(NS)=100.*SYLD(NS)/TYLD(NS)
00401          BTUREC(NS)=100.*YLDCC*SCC(NS,1)*SCC(NS,5)/(SFEED(NS,1)*SFEED(NS,5)
00402         1 )
00403          ASHERR(NS)=SCC(NS,2)-YINTRP(SCMWT,SCMASH,SYLD(NS),NG)
00404    C CALCULATE FLOAT IN REFUSE, SINK IN CLEAN COAL, TOTAL MISPLACED
00405    C MATERIAL AND NEAR GRAVITY 0,10 MATERIAL
00406       53 DO 57 I=1,NSIZE
00407          SG1=SGRAV(I)-0.1
00408          SG2=SGRAV(I)
00409          SG3=SGRAV(I)+0.1
00410          SFLT(I)=0.
00411          SINK(I)=0.
00412          SMISPL(I)=0.
00413          SNRGR(I)=0.
00414          DO 56 J=1,NGRAV
00415          IF (SG2.GT.GBOUND(J)) GO TO 54
00416          SINK(I)=SINK(I)+1.E+4*CC(I,J,1)/SCC(I,1)
00417          SMISPL(I)=SMISPL(I)+1.E+4*SUM1*CC(I,J,1)/SFEED(I,1)
00418          GO TO 56
00419       54 IF (SG2.LT.GBOUND(J+1)) GO TO 55
00420          SFLT(I)=SFLT(I)+1.E+4*REF(I,J,1)/SREF(I,1)
00421          SMISPL(I)=SMISPL(I)+1.E+4*SUM2*REF(I,J,1)/SFEED(I,1)
00422          GO TO 56
00423       55 F=(SG2-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00424          SFLT(I)=SFLT(I)+1.E+4*F*REF(I,J,1)/SREF(I,1)
00425          SINK(I)=SINK(I)+1.E+4*(1.-F)*CC(I,J,1)/SCC(I,1)
00426          SMISPL(I)=SMISPL(I)+1.E+4*(F*SUM2*REF(I,J,1)+(1.-F)*SUM1*
00427         1 CC(I,J,1))/SFEED(I,1)
00428       56 CONTINUE
00429          DO 57 J=1,NGRAV
00430          IF ((SG1.GT.GBOUND(J+1)).OR.(SG3.LT.GBOUND(J))) GO TO 57
00431          F=1.
00432          IF ((SG1.GE.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00433         1 F=(SG3-SG1)/(GBOUND(J+1)-GBOUND(J))
00434          IF ((SG1.LT.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
00435         1 F=(SG3-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
00436          IF ((SG1.GE.GBOUND(J)).AND.(SG3.GT.GBOUND(J+1)))
00437         1 F=(GBOUND(J+1)-SG1)/(GBOUND(J+1)-GBOUND(J))
00438          SNRGR(I)=SNRGR(I)+1.E+4*F*FEED(I,J,1)/SFEED(I,1)
00439       57 CONTINUE
00440
00441          SG1=SGRAV(NS)-0.1
00442          SG2=SGRAV(NS)
00443          SG3=SGRAV(NS)+0.1
00444          SFLT(NS)=0.
00445          SINK(NS)=0.
00446          SMISPL(NS)=0.
00447          SNRGR(NS)=0.
00448          DO 63 J=1,NGRAV
```

```
      IF (SG2.GT.GBOUND(J)) GO TO 59
      DO 58 I=1,NSIZE
      SINK(NS)=SINK(NS)+100.*CC(I,J,1)
   58 SMISPL(NS)=SMISPL(NS)+100.*SUM1*CC(I,J,1)
      GO TO 63
   59 IF (SG2.LT.GBOUND(J+1)) GO TO 61
      DO 60 I=1,NSIZE
      SFLT(NS)=SFLT(NS)+100.*REF(I,J,1)
   60 SMISPL(NS)=SMISPL(NS)+100.*SUM2*REF(I,J,1)
      GO TO 63
   61 F=(SG2-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
      DO 62 I=1,NSIZE
      SFLT(NS)=SFLT(NS)+100.*F*REF(I,J,1)
      SINK(NS)=SINK(NS)+100.*(1.-F)*CC(I,J,1)
   62 SMISPL(NS)=SMISPL(NS)+100.*(F*SUM2*REF(I,J,1)+(1.-F)*SUM1*
     1 CC(I,J,1))
   63 CONTINUE
      DO 65 J=1,NGRAV
      IF ((SG1.GT.GBOUND(J+1)).OR.(SG3.LT.GBOUND(J))) GO TO 65
      F=1.
      IF ((SG1.GE.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
     1 F=(SG3-SG1)/(GBOUND(J+1)-GBOUND(J))
      IF ((SG1.LT.GBOUND(J)).AND.(SG3.LE.GBOUND(J+1)))
     1 F=(SG3-GBOUND(J))/(GBOUND(J+1)-GBOUND(J))
      IF ((SG1.GE.GBOUND(J)).AND.(SG3.GT.GBOUND(J+1)))
     1 F=(GBOUND(J+1)-SG1)/(GBOUND(J+1)-GBOUND(J))
      DO 64 I=1,NSIZE
   64 SNRGR(NS)=SNRGR(NS)+100.*F*FEED(I,J,1)
   65 CONTINUE
C CALCULATE ERROR AREA AND OVERALL RECOVERIES
      DO 69 I=1,NS
      DX1=(SGRAV(I)-GBOUND(1))/100.
      DX2=(GBOUND(NG)-SGRAV(I))/100.
      DO 66 J=1,NGRAV
   66 FACTOR(J)=DISTRB(I,J)
      YL=YINTRP(GRAV,FACTOR,GBOUND(1),NGRAV)
      YR=YINTRP(GRAV,FACTOR,GBOUND(NG),NGRAV)
      SUM1=(YL+50.)*DX1/3.
      SUM2=(50.+YR)*DX2/3.
      DO 67 K=2,100,2
      SUM1=SUM1+4.*YINTRP(GRAV,FACTOR,GBOUND(1)+(K-1)*DX1,NGRAV)*DX1/3.
   67 SUM2=SUM2+4.*YINTRP(GRAV,FACTOR,SGRAV(I)+(K-1)*DX2,NGRAV)*DX2/3.
      DO 68 K=3,99,2
      SUM1=SUM1+2.*YINTRP(GRAV,FACTOR,GBOUND(1)+(K-1)*DX1,NGRAV)*DX1/3.
   68 SUM2=SUM2+2.*YINTRP(GRAV,FACTOR,SGRAV(I)+(K-1)*DX2,NGRAV)*DX2/3.
   69 SEA(I)=5.*(100.*(SGRAV(I)-GBOUND(1))-SUM1+SUM2)
      BTUVSL=BTUREC(NS)
      YLDVSL=SYLD(NS)
      RETURN
      END

COMMON BLOCKS

/.COMM./(+546)
XFEED      +0#R      XCC       +144#R      XMID      +310#R      SCMWT     +454#R      SCMASH    +500#R
```

```
SEP     SEP1.F4 FORTRAN V.5A(563) /KI   6-OCT-77        12:33   PAGE 1-9

FACTOR      +524#R        N          +536#I

/BLK1/(+1430)
$FEED         +0#R        $CC        +170#R      $HID       +360#R      $REF       +550#R
$YLD        +740#R        TYLD       +770#R      EFFIC      +1020#R     $TUREC     +1050#R     ABSERR     +1100#R
$FLT       +1130#R        $INK       +1160#R     $MISPL     +1210#R     $NRGR      +1240#R     $GRAV      +1270#R
$PE        +1320#R        $IMP       +1350#R     $FA        +1400#R

/BLK2/(+360)
DISTRB        +0#R

SUBPROGRAMS CALLED

YINTRP  Y       $DSIZE  ABS.

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED )

*NCOMP      1 I       *NS         2 I       *FF         3 R       *NF1        4 I       FEED       5#R
*K          6 I       *NG         7 I       *AX1       10 R       NID        11#R       *SG1       12 R
*LV        13 I        GBOUND    14#R       *YLDVSL    15 R       *IMIN      16 I       *NL        17 I
*DX1       20 R       *Y1        21 R       *IJ        22 I       *NF        23 I       *NF2       24 I
*KBSG      25 I       *SGSP      26 R        S         27#R       *YLDMID   147 R       *BTUVSL   150 R
*YLDREF   151 R       *J1       152 I       *F3        153 R      *J         154 I       *YR       155 R
*SX2      156 R       *SG2      157 R       *SUM4      160 R      *X2        161 R       *IMAX     162 I
*YL       163 R       *II       164 I       *NJNT      165 I      *SGXX      166 R       *DX2      167 R
*YLDCC    170 R        GRAV     171#R       *SUM3      172 R      *F2        173 R       *NSIZE    174 I
 SIZE     175#R       CC        176#R       *X1        177 R      *X         200 R        R        201#R
*NINT     321 I       BTU       322#R        REF       323#R      *SG3       324 R       *L        325 I
*SUM2     326 R       *I1       327 I       *I         330 I      *F1        331 R       *F        332 R
*NGRAV    333 I       *IX       334 I       *KCOUNT    335 I      *SUM1      336 R

TEMPORARIES

.S0021    356 I       .S0022    357 I       .S0023     360 I      .S0024     361 I       .S0025    362 I
.S0026    363 I       .S0027    364 I       .S0010     365 I      .S0011     366 I       .S0012    367 I
.S0013    370 I       .S0060    371 I       .S0014     372 I      .S0061     373 I       .S0015    374 I
.S0062    375 I       .S0016    376 I       .S0063     377 I      .S0017     400 I       .S0064    401 I
.S0065    402 I       .S0066    403 I       .S0000     404 I      .S0001     405 I       .S0002    406 I
.S0003    407 I       .S0050    410 I       .S0004     411 I      .S0051     412 I       .S0005    413 I
.A0016    414 R       .S0052    415 I       .S0006     416 I      .S0053     417 I       .S0007    420 I
.S0054    421 I       .S0055    422 I       .S0056     423 I      .S0057     424 I       .S0040    425 I
.S0041    426 I       .S0042    427 I       .S0043     430 I      .S0044     431 I       .S0045    432 I
.S0046    433 I       .S0047    434 I       .S0030     435 I      .S0031     436 I       .S0032    437 I
.S0033    440 I       .S0034    441 I       .S0035     442 I      .S0036     443 I       .S0037    444 I
.S0020    445 I       .G0000    446 I
```

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	-	-	-	-	-	-	-	-	-	-
00060	-	-	-	-	-	-	-	-	-	-
00070	-	-	-	-	-	-	-	-	-	-
00080	-	-	-	-	-	-	-	-	-	-
00090	70	-	47	50	51	53	57	61	63	65
00100	105	111	73	-	-	-	-	75	100	101
00110	162	164	121	125	-	131	134	144	147	161
00120	222	225	166	177	-	202	205	215	217	220
00130	272	-	241	-	244	250	-	252	256	264
00140	373	375	300	304	-	330	331	-	-	371
00150	-	474	400	413	-	414	416	-	443	444
00160	550	551	477	502	505	520	-	521	523	-
00170	-	627	-	601	604	606	610	613	626	-
00180	710	713	632	643	644	662	665	667	672	675
00190	746	753	-	-	-	716	722	723	725	737
00200	1000	1007	1012	756	761	764	770	771	773	775
00210	1051	1054	1055	1020	1030	-	-	-	-	1046
00220	1122	1134	1135	1062	1067	1100	-	1104	1107	1117
00230	1172	1173	1175	1137	1141	1152	-	1155	1160	1170
00240	1233	1242	1251	1200	1214	-	1217	1223	-	1225
00250	-	1367	-	1255	1261	1276	1314	1315	1330	1343
00260	1476	1501	1504	1415	1417	1421	1424	1437	1455	1474
00270	1525	1527	1534	-	-	-	1505	1510	1513	1514
00280	1614	-	-	1550	-	1553	1555	1564	1573	1602
00290	1631	1647	1662	-	-	1616	1617	1620	1621	1625
00300	1763	1777	2013	1670	1676	1704	1722	1734	1746	1747
00310	2056	2065	2072	2022	2026	2030	2040	2044	2047	2052
00320	2140	2147	2161	2102	2105	2111	2114	2115	2117	2130
00330	2225	2234	2241	2172	2175	2177	2207	2213	2216	2221
00340	2273	2274	-	2251	2253	2255	-	2257	2264	2270
00350	-	2337	-	2275	2301	2303	2312	2321	2323	2332
00360	2352	2354	2356	-	2344	-	-	-	2346	2350
00370	2400	2401	2406	2360	2365	2367	-	-	2373	2377
00380	2454	2457	2465	2410	2412	2413	2415	2427	2441	2450
00390	2526	2530	2531	2473	2503	2512	2515	2516	2517	2524
00400	2606	2614	-	2535	2537	2547	2564	2571	2575	2600
00410	2646	2647	2650	2624	-	-	2633	2637	2642	2644
00420	2711	2722	2733	2651	2652	2654	2661	2672	2703	2704
00430	3015	3025	3027	2734	2744	2755	2767	-	3011	3013
00440	3126	3131	3133	-	3047	-	3067	-	3107	3121
00450	3153	3155	3165	3135	3137	3140	3141	3142	3143	3147
00460	3242	3244	3255	3177	3200	3205	3207	3217	3231	3232
00470	-	3350	-	3265	-	3310	3313	3317	3326	3330
00480	3434	3441	3446	3370	-	3410	3412	3425	-	3430
00490	3522	3541	3543	3450	3457	3462	3471	3476	3503	3505
				3560	3577	3615	3620	-	3622	

```
SEP      OCTAL PROG SIZE=4545  [ SCALARS/ARRAYS=336 + FORMATS=17 + TEMPS/CONS=111 + CODE=3643 + ARGS=214 ]  + COMMON=2556
[ NO ERRORS DETECTED ]
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```
SPLIT   SPLIT1,F4       FORTRAN V,5A(563) /KI   6-OCT-77        12:31   PAGE 1

00001          SUBROUTINE SPLIT(FEED,PROD1,PROD2,BTU,YLD1,YLD2,D1,NSIZE,NGRAV,
00002         1 YLDVSL,BTUVSL,KBSG)
00003    C ***************************************************************************
00004    C THIS SUBROUTINE CAUSES A FLOWSTREAM (FEED) TO BE SPLIT INTO TWO            *
00005    C DISTINCT FLOWSTREAMS (PROD1 AND PROD2) HAVING THE SAME COMPOSITIONS        *
00006    C                                                                            *
00007    C F REPRESENTS THE FRACTION OF FEED GOING INTO PROD1                         *
00008    C ***************************************************************************
00009          DIMENSION FEED(23,10,4),PROD1(23,10,4),PROD2(23,10,4),BTU(4)      * DIM *
00010          COMMON /BLK1/ SFEED(24,5),SCC(24,5),SMID(24,5),SREF(24,5),        * DIM *
00011         1              SYLD(24),TYLD(24),EFFIC(24),BTUREC(24),ASHERR(24), * DIM *
00012         2              SFLT(24),SINK(24),SMISPL(24),SNRGR(24),SGRAV(24),  * DIM *
00013         3              SPE(24),SIMP(24),SEA(24)                           * DIM *
00014          DO 1 I=1,NSIZE
00015          DO 1 J=1,NGRAV
00016          DO 1 K=1,4
00017          PROD1(I,J,K)=FEED(I,J,K)                                          * DIM *
00018          PROD2(I,J,K)=FEED(I,J,K)
00019        1 CONTINUE
00020          F=.01*D1
00021          YLD1=F
00022          YLD2=1.-F
00023          IF (KBSG.EQ.0) RETURN
00024    C ***************************************************************************
00025    C CALCULATE SUMMARY DATA BY SIZE INCREMENTS                                  *
00026    C ***************************************************************************
00027          NS=NSIZE+1
00028          DO 2 K=1,5
00029        2 SFEED(NS,K)=0.                                                    * DIM *
00030          CALL SDSIZE(FEED,SFEED,BTU,NSIZE,NGRAV)
00031          DO 10 I=1,NS
00032          DO 10 K=1,5
00033          SCC(NS,K)=SFEED(NS,K)                                             * DIM *
00034       10 SREF(NS,K)=SFEED(NS,K)
00035          YLDVSL=D1
00036          BTUVSL=100.*SCC(NS,5)/SFEED(NS,5)
00037          RETURN
00038          END

COMMON BLOCKS

/BLK1/(+1430)
SFEED     +0#R      SCC      +170#R    SMID     +360#R    SREF     +550#R    SYLD     +740#R
TYLD      +770#R    EFFIC    +1020#R   BTUREC   +1050#R   ASHERR   +1100#R   SFLT     +1130#R
SINK      +1160#R   SMISPL   +1210#R   SNRGR    +1240#R   SGRAV    +1270#R   SPE      +1320#R
SIMP      +1350#R   SEA      +1400#R

SUBPROGRAMS CALLED

SDSIZE
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SPLIT   SPLIT1.F4       FORTRAN V.5A(563) /KI   6-OCT-77        12:31   PAGE 1-1


SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*YLD1         1 R       *NS           2 I        FEFD         3#R       *K            4 I       *YLDVSL       5 R
*KBSG         6 I       *BTUVSL       7 R        *J          10 I       *D1          11 R       *NSIZE        12 I
 BTU         13#R        PROD2       14#R       *I          15 I       *F           16 R       *YLD2         17 R
*NGRAV       20 I        PROD1       21#R

TEMPORARIES

 .80000      22 I        .80001      23 I        .80002      24 I        .80003      25 I        .80004      26 I
 .80005      27 I        .A0016      30 R


LINE NUMBER/OCTAL LOCATION MAP

      : 0       1       2       3       4       5       6       7       8       9
------:-------------------------------------------------------------------------------
      :
00000 : -       0       -       -       -       -       -       -       -       -
00010 : -       -       -       -      31      35      41      42      56      72
00020 : 101     104     105     110     -       -       -      112     115     116
00030 : 123     129     131     132     137     150     152     -       157

SPLIT   OCTAL PROG SIZE=240  ( SCALARS/ARRAYS=21 + TEMPS/CONS=13 + CODE=176 + ARGS=6 )  + COMMON=1430
( NO ERRORS DETECTED )
```

```
      SUBROUTINE VESSEL(L,N)
C ***********************************************************************
C THIS SUBROUTINE PRINTS THE NAME OF EACH COAL WASHING UNIT            *
C ***********************************************************************
      COMMON /SYS/ G,H
      INTEGER G,H
  100 FORMAT(1H+,42X,21H(CONCENTRATING TABLE))
  101 FORMAT(1H+,42X,21H(DENSE-MEDIUM VESSEL))
  102 FORMAT(1H+,42X,22H(DENSE-MEDIUM CYCLONE))
  103 FORMAT(1H+,42X,14H(HYDROCYCLONE))
  104 FORMAT(1H+,42X,17H(FROTH FLOTATION))
  105 FORMAT(1H+,42X,10H(BAUM JIG))
  106 FORMAT(1H+,42X,16H(ROTARY BREAKER))
  107 FORMAT(1H+,42X,31H(PRIMARY MULTIPLE ROLL CRUSHER))
  108 FORMAT(1H+,42X,30H(PRIMARY GYRATORY/JAW CRUSHER))
  109 FORMAT(1H+,42X,29H(PRIMARY SINGLE ROLL CRUSHER))
  110 FORMAT(1H+,42X,27H(PRIMARY CAGE MILL CRUSHER))
  111 FORMAT(1H+,42X,33H(SECONDARY MULTIPLE ROLL CRUSHER))
  112 FORMAT(1H+,42X,32H(SECONDARY GYRATORY/JAW CRUSHER))
  113 FORMAT(1H+,42X,31H(SECONDARY SINGLE ROLL CRUSHER))
  114 FORMAT(1H+,42X,29H(SECONDARY CAGE MILL CRUSHER))
  115 FORMAT(1H+,42X,18H(DRY UPPER SCREEN))
  116 FORMAT(1H+,42X,18H(DRY LOWER SCREEN))
  117 FORMAT(1H+,42X,18H(WET UPPER SCREEN))
  118 FORMAT(1H+,42X,18H(WET LOWER SCREEN))
  119 FORMAT(1H+,42X,16H(STREAM BLENDER))
  120 FORMAT(1H+,42X,17H(STREAM SPLITTER))
  121 FORMAT(1H+,42X,18H(2-STAGE BAUM JIG))
  200 FORMAT(1H0,57X,19HCONCENTRATING TABLE/)
  201 FORMAT(1H0,57X,19HDENSE-MEDIUM VESSEL/)
  202 FORMAT(1H0,57X,20HDENSE-MEDIUM CYCLONE/)
  203 FORMAT(1H0,61X,12HHYDROCYCLONE/)
  204 FORMAT(1H0,59X,15HFROTH FLOTATION/)
  205 FORMAT(1H0,63X,8HBAUM JIG/)
  206 FORMAT(1H0,60X,14HROTARY BREAKER/)
  207 FORMAT(1H0,52X,29HPRIMARY MULTIPLE ROLL CRUSHER/)
  208 FORMAT(1H0,53X,28HPRIMARY GYRATORY/JAW CRUSHER/)
  209 FORMAT(1H0,53X,27HPRIMARY SINGLE ROLL CRUSHER/)
  210 FORMAT(1H0,54X,25HPRIMARY CAGE MILL CRUSHER/)
  211 FORMAT(1H0,51X,31HSECONDARY MULTIPLE ROLL CRUSHER/)
  212 FORMAT(1H0,52X,30HSECONDARY GYRATORY/JAW CRUSHER/)
  213 FORMAT(1H0,52X,29HSECONDARY SINGLE ROLL CRUSHER/)
  214 FORMAT(1H0,53X,27HSECONDARY CAGE MILL CRUSHER/)
  215 FORMAT(1H0,59X,16HDRY UPPER SCREEN/)
  216 FORMAT(1H0,59X,16HDRY LOWER SCREEN/)
  217 FORMAT(1H0,59X,16HWET UPPER SCREEN/)
  218 FORMAT(1H0,59X,16HWET LOWER SCREEN/)
  219 FORMAT(1H0,60X,14HSTREAM BLENDER/)
  220 FORMAT(1H0,60X,15HSTREAM SPLITTER/)
  221 FORMAT(1H0,59X,16H2-STAGE BAUM JIG/)
  300 FORMAT(1H+,24X,21H(CONCENTRATING TABLE))
  301 FORMAT(1H+,24X,21H(DENSE-MEDIUM VESSEL))
  302 FORMAT(1H+,24X,22H(DENSE-MEDIUM CYCLONE))
  303 FORMAT(1H+,24X,14H(HYDROCYCLONE))
  304 FORMAT(1H+,24X,17H(FROTH FLOTATION))
  305 FORMAT(1H+,24X,10H(BAUM JIG))
```

```
00057      306 FORMAT(1H+,24X,16H(ROTARY BREAKER))
00058      307 FORMAT(1H+,24X,31H(PRIMARY MULTIPLE ROLL CRUSHER))
00059      308 FORMAT(1H+,24X,30H(PRIMARY GYRATORY/JAW CRUSHER))
00060      309 FORMAT(1H+,24X,29H(PRIMARY SINGLE ROLL CRUSHER))
00061      310 FORMAT(1H+,24X,27H(PRIMARY CAGE MILL CRUSHER))
00062      311 FORMAT(1H+,24X,33H(SECONDARY MULTIPLE ROLL CRUSHER))
00063      312 FORMAT(1H+,24X,32H(SECONDARY GYRATORY/JAW CRUSHER))
00064      313 FORMAT(1H+,24X,31H(SECONDARY SINGLE ROLL CRUSHER))
00065      314 FORMAT(1H+,24X,29H(SECONDARY CAGE MILL CRUSHER))
00066      315 FORMAT(1H+,24X,18H(DRY UPPER SCREEN))
00067      316 FORMAT(1H+,24X,18H(DRY LOWER SCREEN))
00068      317 FORMAT(1H+,24X,18H(WET UPPER SCREEN))
00069      318 FORMAT(1H+,24X,18H(WET LOWER SCREEN))
00070      319 FORMAT(1H+,24X,16H(STREAM BLENDER))
00071      320 FORMAT(1H+,24X,17H(STREAM SPLITTER))
00072      321 FORMAT(1H+,24X,18H(2-STAGE BAUM JIG))
00073          L1=L
00074          IF ((L.GE.11).AND.(L.LT.20)) L1=L-3
00075          IF ((L.GE.21).AND.(L.LT.25)) L1=L-4
00076          IF (L.EQ.41) L1=21
00077          IF (L.EQ.51) L1=22
00078          IF (N.EQ.2) GO TO 23
00079          IF (N.EQ.3) GO TO 50
00080          GO TO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22),
00081         1 L1
00082        1 WRITE (H,100)
00083          RETURN
00084        2 WRITE (H,101)
00085          RETURN
00086        3 WRITE (H,102)
00087          RETURN
00088        4 WRITE (H,103)
00089          RETURN
00090        5 WRITE (H,105)
00091          RETURN
00092        6 WRITE (H,121)
00093          RETURN
00094        7 WRITE (H,104)
00095          RETURN
00096        8 WRITE (H,106)
00097          RETURN
00098        9 WRITE (H,107)
00099          RETURN
00100       10 WRITE (H,108)
00101          RETURN
00102       11 WRITE (H,109)
00103          RETURN
00104       12 WRITE (H,110)
00105          RETURN
00106       13 WRITE (H,111)
00107          RETURN
00108       14 WRITE (H,112)
00109          RETURN
00110       15 WRITE (H,113)
00111          RETURN
00112       16 WRITE (H,114)
```

```
00113          RETURN
00114       17 WRITE (H,115)
00115          RETURN
00116       18 WRITE (H,116)
00117          RETURN
00118       19 WRITE (H,117)
00119          RETURN
00120       20 WRITE (H,118)
00121          RETURN
00122       21 WRITE (H,119)
00123          RETURN
00124       22 WRITE (H,120)
00125          RETURN
00126       23 GO TO (24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,
00127         1 43,44,45),L1
00128       24 WRITE (H,200)
00129          RETURN
00130       25 WRITE (H,201)
00131          RETURN
00132       26 WRITE (H,202)
00133          RETURN
00134       27 WRITE (H,203)
00135          RETURN
00136       28 WRITE (H,205)
00137          RETURN
00138       29 WRITE (H,221)
00139          RETURN
00140       30 WRITE (H,204)
00141          RETURN
00142       31 WRITE (H,206)
00143          RETURN
00144       32 WRITE (H,207)
00145          RETURN
00146       33 WRITE (H,208)
00147          RETURN
00148       34 WRITE (H,209)
00149          RETURN
00150       35 WRITE (H,210)
00151          RETURN
00152       36 WRITE (H,211)
00153          RETURN
00154       37 WRITE (H,212)
00155          RETURN
00156       38 WRITE (H,213)
00157          RETURN
00158       39 WRITE (H,214)
00159          RETURN
00160       40 WRITE (H,215)
00161          RETURN
00162       41 WRITE (H,216)
00163          RETURN
00164       42 WRITE (H,217)
00165          RETURN
00166       43 WRITE (H,218)
00167          RETURN
00168       44 WRITE (H,219)
```

```
00169          RETURN
00170       45 WRITE (H,220)
00171          RETURN
00172       50 GO TO (51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,
00173         1         66,67,68,69,70,71,72),L1
00174       51 WRITE (H,300)
00175          RETURN
00176       52 WRITE (H,301)
00177          RETURN
00178       53 WRITE (H,302)
00179          RETURN
00180       54 WRITE (H,303)
00181          RETURN
00182       55 WRITE (H,305)
00183          RETURN
00184       56 WRITE (H,321)
00185          RETURN
00186       57 WRITE (H,304)
00187          RETURN
00188       58 WRITE (H,306)
00189          RETURN
00190       59 WRITE (H,307)
00191          RETURN
00192       60 WRITE (H,308)
00193          RETURN
00194       61 WRITE (H,309)
00195          RETURN
00196       62 WRITE (H,310)
00197          RETURN
00198       63 WRITE (H,311)
00199          RETURN
00200       64 WRITE (H,312)
00201          RETURN
00202       65 WRITE (H,313)
00203          RETURN
00204       66 WRITE (H,314)
00205          RETURN
00206       67 WRITE (H,315)
00207          RETURN
00208       68 WRITE (H,316)
00209          RETURN
00210       69 WRITE (H,317)
00211          RETURN
00212       70 WRITE (H,318)
00213          RETURN
00214       71 WRITE (H,319)
00215          RETURN
00216       72 WRITE (H,320)
00217          RETURN
00218          END
```

COMMON BLOCKS

/SYS/(+2)
G +0 I H +1 I

SUBPROGRAMS CALLED

SCALARS AND ARRAYS ["*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED]

*N   1 I   *L1   2 I   *L   3 I

TEMPORARIES

 .A0016   747 R

LINE NUMBER/OCTAL LOCATION MAP

	0	1	2	3	4	5	6	7	8	9
00000	-	0	-	-	-	-	-	-	-	-
00010	-	-	-	-	-	-	-	-	-	-
00020	-	-	-	-	-	-	-	-	-	-
00030	-	-	-	-	-	-	-	-	-	-
00040	-	-	-	-	-	-	-	-	-	-
00050	-	-	-	-	-	-	-	-	-	-
00060	-	-	-	-	-	-	-	-	-	-
00070	-	-	-	-	-	-	-	-	-	-
00080	36	-	70	73	74	77	100	103	104	107
00090	110	113	114	117	120	123	124	127	130	133
00100	134	137	140	143	144	147	150	153	154	157
00110	160	163	164	167	170	173	174	177	200	203
00120	204	207	210	213	214	217	220	-	252	255
00130	256	261	262	265	266	271	272	275	276	301
00140	302	305	306	311	312	315	316	321	322	325
00150	326	331	332	335	336	341	342	345	346	351
00160	352	355	356	361	362	365	366	371	372	375
00170	376	401	402	-	434	437	440	443	444	447
00180	450	453	454	457	460	463	464	467	470	473
00190	474	477	500	503	504	507	510	513	514	517
00200	520	523	524	527	530	533	534	537	540	543
00210	544	547	550	553	554	557	560	-	563	

VESSEL OCTAL PROG SIZE=2351 [SCALARS/ARRAYS=3 + FORMATS=743 + TEMPS/CONS=1 + CODE=566 + ARGS=614] + COMMON=2
[NO ERRORS DETECTED]

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00001         FUNCTION Y(X,L,I1)
00002   C ***************************************************************************
00003   C THIS FUNCTION EVALUATES A POINT ON THE DISTRIBUTION CURVE                   *
00004   C FOR A GIVEN VESSEL (L) AND GIVEN SIZE (I1)                                  *
00005   C USING LAGRANGIAN INTERPOLATION                                              *
00006   C ***************************************************************************
00007         DIMENSION XDATA(20,10,8),YDATA(20,10,8),
00008        1 XTAB1(20),XTAB2(20),XTAB3(20),XTAB4(20),XTAB5(20),XTAB6(20),      TABLES
00009        2 XTAB7(20),XTAB8(20),XTAB9(20),XTAB10(20),                         TABLES
00010        3 XDMV1(20),XDMV2(20),XDMV3(20),XDMV4(20),XDMV5(20),XDMV6(20),      DMV
00011        4 XDMV7(20),XDMV8(20),XDMV9(20),XDMV10(20),                         DMV
00012        5 XDMC1(20),XDMC2(20),XDMC3(20),XDMC4(20),XDMC5(20),XDMC6(20),      DMC
00013        6 XDMC7(20),XDMC8(20),XDMC9(20),XDMC10(20),                         DMC
00014        7 XHC1(20),XHC2(20),XHC3(20),XHC4(20),XHC5(20),XHC6(20),            HC
00015        8 XHC7(20),XHC8(20),XHC9(20),XHC10(20),                             HC
00016        9 XFF1(20),XFF2(20),XFF3(20),XFF4(20),XFF5(20),XFF6(20),            FF
00017        * XFF7(20),XFF8(20),XFF9(20),XFF10(20),                             FF
00018        A XJOV1(20),XJOV2(20),XJOV3(20),XJOV4(20),XJOV5(20),XJOV6(20),      JIG-OV
00019        B XJOV7(20),XJOV8(20),XJOV9(20),XJOV10(20),                         JIG-OV
00020        C XJP1(20),XJP2(20),XJP3(20),XJP4(20),XJP5(20),XJP6(20),            JIG-PR
00021        D XJP7(20),XJP8(20),XJP9(20),XJP10(20),                             JIG-PR
00022        E XJS1(20),XJS2(20),XJS3(20),XJS4(20),XJS5(20),XJS6(20),            JIG-SEC
00023        F XJS7(20),XJS8(20),XJS9(20),XJS10(20)                              JIG-SEC
00024         DIMENSION YTAB1(20),YTAB2(20),YTAB3(20),YTAB4(20),YTAB5(20),       TABLES
00025        1 YTAB6(20),YTAB7(20),YTAB8(20),YTAB9(20),YTAB10(20),               TABLES
00026        2 YDMV1(20),YDMV2(20),YDMV3(20),YDMV4(20),YDMV5(20),YDMV6(20),      DMV
00027        3 YDMV7(20),YDMV8(20),YDMV9(20),YDMV10(20),                         DMV
00028        4 YDMC1(20),YDMC2(20),YDMC3(20),YDMC4(20),YDMC5(20),YDMC6(20),      DMC
00029        5 YDMC7(20),YDMC8(20),YDMC9(20),YDMC10(20),                         DMC
00030        6 YHC1(20),YHC2(20),YHC3(20),YHC4(20),YHC5(20),YHC6(20),            HC
00031        7 YHC7(20),YHC8(20),YHC9(20),YHC10(20),                             HC
00032        8 YFF1(20),YFF2(20),YFF3(20),YFF4(20),YFF5(20),YFF6(20),            FF
00033        9 YFF7(20),YFF8(20),YFF9(20),YFF10(20),                             FF
00034        * YJOV1(20),YJOV2(20),YJOV3(20),YJOV4(20),YJOV5(20),YJOV6(20),      JIG-OV
00035        A YJOV7(20),YJOV8(20),YJOV9(20),YJOV10(20),                         JIG-OV
00036        B YJP1(20),YJP2(20),YJP3(20),YJP4(20),YJP5(20),YJP6(20),            JIG-PR
00037        C YJP7(20),YJP8(20),YJP9(20),YJP10(20),                             JIG-PR
00038        D YJS1(20),YJS2(20),YJS3(20),YJS4(20),YJS5(20),YJS6(20),            JIG-SEC
00039        E YJS7(20),YJS8(20),YJS9(20),YJS10(20)                              JIG-SEC
00040         DIMENSION XUSED(20), YUSED(20)
00041         EQUIVALENCE (XTAB1 (1),XDATA(1 ,1 ,1)),(YTAB1 (1),YDATA(1 ,1 ,1))
00042         EQUIVALENCE (XTAB2 (1),XDATA(1 ,2 ,1)),(YTAB2 (1),YDATA(1 ,2 ,1))
00043         EQUIVALENCE (XTAB3 (1),XDATA(1 ,3 ,1)),(YTAB3 (1),YDATA(1 ,3 ,1))
00044         EQUIVALENCE (XTAB4 (1),XDATA(1 ,4 ,1)),(YTAB4 (1),YDATA(1 ,4 ,1))
00045         EQUIVALENCE (XTAB5 (1),XDATA(1 ,5 ,1)),(YTAB5 (1),YDATA(1 ,5 ,1))
00046         EQUIVALENCE (XTAB6 (1),XDATA(1 ,6 ,1)),(YTAB6 (1),YDATA(1 ,6 ,1))
00047         EQUIVALENCE (XTAB7 (1),XDATA(1 ,7 ,1)),(YTAB7 (1),YDATA(1 ,7 ,1))
00048         EQUIVALENCE (XTAB8 (1),XDATA(1 ,8 ,1)),(YTAB8 (1),YDATA(1 ,8 ,1))
00049         EQUIVALENCE (XTAB9 (1),XDATA(1 ,9 ,1)),(YTAB9 (1),YDATA(1 ,9 ,1))
00050         EQUIVALENCE (XTAB10(1),XDATA(1 ,10,1)),(YTAB10(1),YDATA(1 ,10,1))
00051         EQUIVALENCE (XDMV1 (1),XDATA(1 ,1 ,2)),(YDMV1 (1),YDATA(1 ,1 ,2))
00052         EQUIVALENCE (XDMV2 (1),XDATA(1 ,2 ,2)),(YDMV2 (1),YDATA(1 ,2 ,2))
00053         EQUIVALENCE (XDMV3 (1),XDATA(1 ,3 ,2)),(YDMV3 (1),YDATA(1 ,3 ,2))
00054         EQUIVALENCE (XDMV4 (1),XDATA(1 ,4 ,2)),(YDMV4 (1),YDATA(1 ,4 ,2))
00055         EQUIVALENCE (XDMV5 (1),XDATA(1 ,5 ,2)),(YDMV5 (1),YDATA(1 ,5 ,2))
00056         EQUIVALENCE (XDMV6 (1),XDATA(1 ,6 ,2)),(YDMV6 (1),YDATA(1 ,6 ,2))
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00057        EQUIVALENCE (XDMV7 (1),XDATA(1 ,7 ,2)),(YDMV7 (1),YDATA(1 ,7 ,2))
00058        EQUIVALENCE (XDMV8 (1),XDATA(1 ,8 ,2)),(YDMV8 (1),YDATA(1 ,8 ,2))
00059        EQUIVALENCE (XDMV9 (1),XDATA(1 ,9 ,2)),(YDMV9 (1),YDATA(1 ,9 ,2))
00060        EQUIVALENCE (XDMV10(1),XDATA(1 ,10,2)),(YDMV10(1),YDATA(1 ,10,2))
00061        EQUIVALENCE (XDMC1 (1),XDATA(1 ,1 ,3)),(YDMC1 (1),YDATA(1 ,1 ,3))
00062        EQUIVALENCE (XDMC2 (1),XDATA(1 ,2 ,3)),(YDMC2 (1),YDATA(1 ,2 ,3))
00063        EQUIVALENCE (XDMC3 (1),XDATA(1 ,3 ,3)),(YDMC3 (1),YDATA(1 ,3 ,3))
00064        EQUIVALENCE (XDMC4 (1),XDATA(1 ,4 ,3)),(YDMC4 (1),YDATA(1 ,4 ,3))
00065        EQUIVALENCE (XDMC5 (1),XDATA(1 ,5 ,3)),(YDMC5 (1),YDATA(1 ,5 ,3))
00066        EQUIVALENCE (XDMC6 (1),XDATA(1 ,6 ,3)),(YDMC6 (1),YDATA(1 ,6 ,3))
00067        EQUIVALENCE (XDMC7 (1),XDATA(1 ,7 ,3)),(YDMC7 (1),YDATA(1 ,7 ,3))
00068        EQUIVALENCE (XDMC8 (1),XDATA(1 ,8 ,3)),(YDMC8 (1),YDATA(1 ,8 ,3))
00069        EQUIVALENCE (XDMC9 (1),XDATA(1 ,9 ,3)),(YDMC9 (1),YDATA(1 ,9 ,3))
00070        EQUIVALENCE (XDMC10(1),XDATA(1 ,10,3)),(YDMC10(1),YDATA(1 ,10,3))
00071        EQUIVALENCE (XMC1  (1),XDATA(1 ,1 ,4)),(YMC1  (1),YDATA(1 ,1 ,4))
00072        EQUIVALENCE (XMC2  (1),XDATA(1 ,2 ,4)),(YMC2  (1),YDATA(1 ,2 ,4))
00073        EQUIVALENCE (XMC3  (1),XDATA(1 ,3 ,4)),(YMC3  (1),YDATA(1 ,3 ,4))
00074        EQUIVALENCE (XMC4  (1),XDATA(1 ,4 ,4)),(YMC4  (1),YDATA(1 ,4 ,4))
00075        EQUIVALENCE (XMC5  (1),XDATA(1 ,5 ,4)),(YMC5  (1),YDATA(1 ,5 ,4))
00076        EQUIVALENCE (XMC6  (1),XDATA(1 ,6 ,4)),(YMC6  (1),YDATA(1 ,6 ,4))
00077        EQUIVALENCE (XMC7  (1),XDATA(1 ,7 ,4)),(YMC7  (1),YDATA(1 ,7 ,4))
00078        EQUIVALENCE (XMC8  (1),XDATA(1 ,8 ,4)),(YMC8  (1),YDATA(1 ,8 ,4))
00079        EQUIVALENCE (XMC9  (1),XDATA(1 ,9 ,4)),(YMC9  (1),YDATA(1 ,9 ,4))
00080        EQUIVALENCE (XMC10 (1),XDATA(1 ,10,4)),(YMC10 (1),YDATA(1 ,10,4))
00081        EQUIVALENCE (XJOV1 (1),XDATA(1 ,1 ,5)),(YJOV1 (1),YDATA(1 ,1 ,5))
00082        EQUIVALENCE (XJOV2 (1),XDATA(1 ,2 ,5)),(YJOV2 (1),YDATA(1 ,2 ,5))
00083        EQUIVALENCE (XJOV3 (1),XDATA(1 ,3 ,5)),(YJOV3 (1),YDATA(1 ,3 ,5))
00084        EQUIVALENCE (XJOV4 (1),XDATA(1 ,4 ,5)),(YJOV4 (1),YDATA(1 ,4 ,5))
00085        EQUIVALENCE (XJOV5 (1),XDATA(1 ,5 ,5)),(YJOV5 (1),YDATA(1 ,5 ,5))
00086        EQUIVALENCE (XJOV6 (1),XDATA(1 ,6 ,5)),(YJOV6 (1),YDATA(1 ,6 ,5))
00087        EQUIVALENCE (XJOV7 (1),XDATA(1 ,7 ,5)),(YJOV7 (1),YDATA(1 ,7 ,5))
00088        EQUIVALENCE (XJOV8 (1),XDATA(1 ,8 ,5)),(YJOV8 (1),YDATA(1 ,8 ,5))
00089        EQUIVALENCE (XJOV9 (1),XDATA(1 ,9 ,5)),(YJOV9 (1),YDATA(1 ,9 ,5))
00090        EQUIVALENCE (XJOV10(1),XDATA(1 ,10,5)),(YJOV10(1),YDATA(1 ,10,5))
00091        EQUIVALENCE (XJP1  (1),XDATA(1 ,1 ,6)),(YJP1  (1),YDATA(1 ,1 ,6))
00092        EQUIVALENCE (XJP2  (1),XDATA(1 ,2 ,6)),(YJP2  (1),YDATA(1 ,2 ,6))
00093        EQUIVALENCE (XJP3  (1),XDATA(1 ,3 ,6)),(YJP3  (1),YDATA(1 ,3 ,6))
00094        EQUIVALENCE (XJP4  (1),XDATA(1 ,4 ,6)),(YJP4  (1),YDATA(1 ,4 ,6))
00095        EQUIVALENCE (XJP5  (1),XDATA(1 ,5 ,6)),(YJP5  (1),YDATA(1 ,5 ,6))
00096        EQUIVALENCE (XJP6  (1),XDATA(1 ,6 ,6)),(YJP6  (1),YDATA(1 ,6 ,6))
00097        EQUIVALENCE (XJP7  (1),XDATA(1 ,7 ,6)),(YJP7  (1),YDATA(1 ,7 ,6))
00098        EQUIVALENCE (XJP8  (1),XDATA(1 ,8 ,6)),(YJP8  (1),YDATA(1 ,8 ,6))
00099        EQUIVALENCE (XJP9  (1),XDATA(1 ,9 ,6)),(YJP9  (1),YDATA(1 ,9 ,6))
00100        EQUIVALENCE (XJP10 (1),XDATA(1 ,10,6)),(YJP10 (1),YDATA(1 ,10,6))
00101        EQUIVALENCE (XJS1  (1),XDATA(1 ,1 ,7)),(YJS1  (1),YDATA(1 ,1 ,7))
00102        EQUIVALENCE (XJS2  (1),XDATA(1 ,2 ,7)),(YJS2  (1),YDATA(1 ,2 ,7))
00103        EQUIVALENCE (XJS3  (1),XDATA(1 ,3 ,7)),(YJS3  (1),YDATA(1 ,3 ,7))
00104        EQUIVALENCE (XJS4  (1),XDATA(1 ,4 ,7)),(YJS4  (1),YDATA(1 ,4 ,7))
00105        EQUIVALENCE (XJS5  (1),XDATA(1 ,5 ,7)),(YJS5  (1),YDATA(1 ,5 ,7))
00106        EQUIVALENCE (XJS6  (1),XDATA(1 ,6 ,7)),(YJS6  (1),YDATA(1 ,6 ,7))
00107        EQUIVALENCE (XJS7  (1),XDATA(1 ,7 ,7)),(YJS7  (1),YDATA(1 ,7 ,7))
00108        EQUIVALENCE (XJS8  (1),XDATA(1 ,8 ,7)),(YJS8  (1),YDATA(1 ,8 ,7))
00109        EQUIVALENCE (XJS9  (1),XDATA(1 ,9 ,7)),(YJS9  (1),YDATA(1 ,9 ,7))
00110        EQUIVALENCE (XJS10 (1),XDATA(1 ,10,7)),(YJS10 (1),YDATA(1 ,10,7))
00111        EQUIVALENCE (XFF1  (1),XDATA(1 ,1 ,8)),(YFF1  (1),YDATA(1 ,1 ,8))
00112        EQUIVALENCE (XFF2  (1),XDATA(1 ,2 ,8)),(YFF2  (1),YDATA(1 ,2 ,8))
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00113          EQUIVALENCE (XFF3  (1),XDATA(1 ,3 ,A)),(YFF3  (1),YDATA(1 ,3 ,A))
00114          EQUIVALENCE (XFF4  (1),XDATA(1 ,4 ,A)),(YFF4  (1),YDATA(1 ,4 ,A))
00115          EQUIVALENCE (XFF5  (1),XDATA(1 ,5 ,A)),(YFF5  (1),YDATA(1 ,5 ,A))
00116          EQUIVALENCE (XFF6  (1),XDATA(1 ,6 ,A)),(YFF6  (1),YDATA(1 ,6 ,A))
00117          EQUIVALENCE (XFF7  (1),XDATA(1 ,7 ,A)),(YFF7  (1),YDATA(1 ,7 ,A))
00118          EQUIVALENCE (XFF8  (1),XDATA(1 ,8 ,A)),(YFF8  (1),YDATA(1 ,8 ,A))
00119          EQUIVALENCE (XFF9  (1),XDATA(1 ,9 ,A)),(YFF9  (1),YDATA(1 ,9 ,A))
00120          EQUIVALENCE (XFF10 (1),XDATA(1 ,10,A)),(YFF10 (1),YDATA(1 ,10,A))
00121          DATA XTAB1 / .828,.88,.89,.9,.914,.9240,.9303,.9336,.9502,.9685,  TAB=1
00122         1 1.,1.0340,1.0714,1.0764,1.086,1.0940,1.1052,1.1130,1.3,1.5 /     TAB=1
00123          DATA XTAB2 / .834,.856,.87,.88,.89,.902,.91,.937,.9477,.9695,1.,  TAB=2
00124         1 1.0355,1.0462,1.069,1.09,1.116,1.14,1.168,1.2,1.556 /            TAB=2
00125          DATA XTAB3 / .785,.85,.865,.885,.9,.92,.93,.975,1.,1.05,1.08,     TAB=3
00126         1 1.095,1.12,1.15,1.2,1.26,1.7,1.8,1.9,2. /                        TAB=3
00127          DATA XTAB4 / .759,.82,.83,.85,.865,.875,.89,.9056,.9227,1.,       TAB=4
00128         1 1.0762,1.0915,1.12,1.16,1.205,1.325,1.475,1.669,1.8,2. /         TAB=4
00129          DATA XTAB5 / .731,.76,.78,.80A,.84,.862,.9033,1.,1.1164,1.16,1.2, TAB=5
00130         1 1.26,1.3,1.36,1.6,1.8,2.,2.05,2.1,2.15 /                         TAB=5
00131          DATA XTAB6 / .663,.72,.78,.82,.862,.888,.9112,1.,1.026,1.04,      TAB=6
00132         1 1.079,1.1248,1.22,1.24,1.27,1.32,1.38,2.,2.05,2.1 /              TAB=6
00133          DATA XTAB7 / .606,.64,.68,.724,.76,.8,.836,.852,.9,1.,1.06,1.124, TAB=7
00134         1 1.2,1.32,1.4,1.6,2.,2.05,2.1,2.15 /                              TAB=7
00135          DATA XTAB8 / .728,.76,.8,.844,.864,.88,.9110,.9173,.9304,1.,      TAB=COMP
00136         1 1.0452,1.0664,1.08,1.152,1.184,1.208,1.24,1.4,2.,2.05 /          TAB=COMP
00137          DATA XTAB9 / 20*0. /                                               TAB=9
00138          DATA XTAB10 / 20*0. /                                              TAB=10
00139          DATA XDMV1 / .97,.9708,.9718,.9734,.9896,1.,                       DMV=1
00140         1 1.0125,1.0258,1.0302,1.0311,1.0324,                               DMV=1
00141         2       1.033,1.04,1.05,1.06,1.07,1.08,1.09,1.1,1.11 /              DMV=1
00142          DATA XDMV2 / .928,.94,.95,.962,.969,.9728,.9806,1.,1.0063,1.0183,  DMV=2
00143         1 1.0306,1.0340,1.0416,1.049,1.056,1.057,1.058,1.059,1.06,1.061 /   DMV=2
00144          DATA XDMV3 / .878,.9,.927,.946,.9600,.9695,.9741,.985,1.,1.0162,   DMV=3
00145         1 1.033,1.0385,1.0478,1.0608,1.0675,1.085,1.086,1.087,1.088,1.089/  DMV=3
00146          DATA XDMV4 / .775,.923,.938,.95,.9555,.9647,.9804,1.,1.0258,       DMV=4
00147         1 1.0463,1.055,1.07,1.083,1.105,1.114,1.117,1.118,1.119,1.12,       DMV=4
00148         2 1.121 /                                                           DMV=4
00149          DATA XDMV5 / .818,.837,.862,.893,.92,.942,.9529,.9552,.9776,1.,    DMV=5
00150         1 1.0244,1.0356,1.0415,1.05,1.075,1.105,1.135,1.175,1.2,1.237 /     DMV=5
00151          DATA XDMV6 / .805,.85,.9,.93,.958,.969,.9823,1.,1.0197,1.028,      DMV=COMP
00152         1 1.037,1.062,1.088,1.14,1.175,1.222,1.223,1.224,1.225,1.226 /      DMV=COMP
00153          DATA XDMV7 / 20*0. /                                               DMV=7
00154          DATA XDMV8 / 20*0. /                                               DMV=8
00155          DATA XDMV9 / 20*0. /                                               DMV=9
00156          DATA XDMV10 / 20*0. /                                              DMV=10
00157          DATA XDMC1 / .946,.955,.965,.97,.973,.974,1.,1.023,1.025,1.028,    DMC=1
00158         1 1.033,1.041,1.05,1.06,1.07,1.078,1.079,1.08,1.081,1.082 /         DMC=1
00159          DATA XDMC2 / .917,.925,.94,.95,.958,.965,.973,.985,1.,1.02,1.025,  DMC=2
00160         1 1.033,1.035,1.04,1.05,1.063,1.075,1.076,1.077,1.078 /             DMC=2
00161          DATA XDMC3 / .902,.94,.95,.956,.963,.965,.972,.98,1.,1.015,1.031,  DMC=3
00162         1 1.033,1.037,1.048,1.062,1.075,1.091,1.092,1.093,1.094 /           DMC=3
00163          DATA XDMC4 / .877,.89,.9,.915,.945,.96,.968,.98,1.,1.015,1.031,    DMC=4
00164         1 1.04,1.055,1.075,1.1,1.13,1.14,1.159,1.16,1.161 /                 DMC=4
00165          DATA XDMC5 / .83,.86,.88,.901,.925,.942,.955,.96,.964,.98,1.,      DMC=5
00166         1 1.03,1.037,1.057,1.075,1.102,1.14,1.175,1.222,1.3 /               DMC=5
00167          DATA XDMC6 / .775,.8,.835,.85,.9,.925,.94,.95,.955,.975,1.,        DMC=6
00168         1 1.035,1.045,1.05,1.06,1.09,1.125,1.3,1.507,1.508 /                DMC=6
```

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00169          DATA XDMC7 / .823,.904,.943,.949,.954,.961,.962,.9647,.98,1.,        DMC=COMP
00170         1 1.02,1.023,1.03,1.039,1.061,1.082,1.124,1.218,1.36,1.361 /          DMC=COMP
00171          DATA XDMC8 / 20*0. /                                                 DMC=8
00172          DATA XDMC9 / 20*0. /                                                 DMC=9
00173          DATA XDMC10 /20*0. /                                                 DMC=10
00174          DATA XHC1 / .7,.74,.788,.827,.859,.88,.91,.923,.942,1.,1.02,         HC=1
00175         1 1.058,1.134,1.165,1.206,1.28,1.365,1.48,1.58,1.7 /                  HC=1
00176          DATA XHC2 / .6,.7,.79,.86,.895,.945,1.,1.035,1.077,1.105,1.152,      HC=2
00177         1 1.193,1.243,1.282,1.388,1.56,1.66,1.798,1.799,1.8 /                 HC=2
00178          DATA XHC3 / .45,.525,.575,.635,.695,.817,.917,.97,1.,1.057,1.083,    HC=3
00179         1 1.109,1.175,1.233,1.285,1.33,1.425,1.575,1.75,1.9 /                 HC=3
00180          DATA XHC4 / .3,.38,.48,.576,.618,.699,.8,.891,.94,1.,1.074,1.101,    HC=4
00181         1 1.153,1.198,1.28,1.322,1.36,1.794,2.32,2.33 /                       HC=4
00182          DATA XHC5 / .325,.425,.517,.62,.75,.79,.844,.883,.901,1.,1.109,      HC=5
00183         1 1.23,1.242,1.275,1.305,1.332,1.35,1.402,1.575,1.9 /                 HC=5
00184          DATA XHC6 / .47,.511,.562,.704,.793,.821,.844,.881,.909,1.,1.041,    HC=6
00185         1 1.07,1.118,1.263,1.3,1.343,1.38,1.511,1.6,1.7 /                     HC=6
00186          DATA XHC7 / .5,.625,.85,.865,.875,.885,1.,1.02,1.035,1.055,1.08,     HC=7
00187         1 1.1,1.155,1.18,1.195,1.215,1.25,1.315,1.375,1.376 /                 HC=7
00188          DATA XHC8 / .685,.728,.772,.82,.861,1.,1.034,1.059,1.1,1.167,        HC=COMP
00189         1 1.212,1.255,1.299,1.343,1.388,1.433,1.476,1.52,1.521,1.522 /        HC=COMP
00190          DATA XHC9 / 20*0. /                                                  HC=9
00191          DATA XHC10 / 20*0. /                                                 HC=10
00192          DATA XFF1 / .1,.2,.3,.4,.5,.6,.7,.8,.9,1.0,1.1,1.2,1.3,1.4,1.5,      FF=1
00193         1 1.6,1.7,1.8,1.9,2.0 /                                               FF=1
00194          DATA XFF2 / .1,.2,.3,.4,.5,.6,.7,.8,.9,1.0,1.1,1.2,1.3,1.4,1.5,      FF=2
00195         1 1.6,1.7,1.8,1.9,2.0 /                                               FF=2
00196          DATA XFF3 / 20*0. /                                                  FF=3
00197          DATA XFF4 / 20*0. /                                                  FF=4
00198          DATA XFF5 / 20*0. /                                                  FF=5
00199          DATA XFF6 / 20*0. /                                                  FF=6
00200          DATA XFF7 / 20*0. /                                                  FF=7
00201          DATA XFF8 / 20*0. /                                                  FF=8
00202          DATA XFF9 / 20*0. /                                                  FF=9
00203          DATA XFF10 / 20*0. /                                                 FF=10
00204          DATA XJOV1 / .897,.903,.907,.915,.94,.972,1.,1.035,1.054,1.057,      JOV=1
00205         1 1.062,1.07,1.08,1.095,1.1,1.107,1.108,1.109,1.1,1.101 /             JOV=1
00206          DATA XJOV2 / .888,.895,.903,.946,.957,.9635,.9709,1.,1.0247,         JOV=2
00207         1 1.0309,1.038,1.048,1.066,1.085,1.097,1.108,1.168,1.232,1.233,       JOV=2
00208         2 1.234 /                                                             JOV=2
00209          DATA XJOV3 / .8,.827,.851,.882,.893,.899,.957,1.,1.0547,1.1004,      JOV=3
00210         1 1.1053,1.114,1.1274,1.1386,1.157,1.265,1.445,1.74,1.741,1.742 /     JOV=3
00211          DATA XJOV4 / .74,.763,.785,.811,.835,.8504,.9377,1.,1.0882,          JOV=4
00212         1 1.096,1.109,1.145,1.188,1.232,1.306,1.418,1.553,1.7,1.701,1.702/    JOV=4
00213          DATA XJOV5 / .682,.718,.76,.794,.82,.846,.861,.9188,1.,1.063,        JOV=5
00214         1 1.1315,1.1555,1.1718,1.202,1.246,1.31,1.386,1.496,1.708,2. /        JOV=5
00215          DATA XJOV6 / .708,.73,.748,.768,.782,.804,.858,.902,1.,1.042,        JOV=6
00216         1 1.059,1.084,1.114,1.1512,1.364,1.4328,1.492,1.602,1.756,1.9 /       JOV=6
00217          DATA XJOV7 / .588,.612,.644,.682,.72,.74,.78,.883,1.,1.046,1.064,    JOV=7
00218         1 1.094,1.146,1.242,1.338,1.49,1.678,2.,2.001,2.002 /                 JOV=7
00219          DATA XJOV8 / .784,.812,.838,.855,.87,.882,.8940,.9384,1.,1.022,      JOV=COMP
00220         1 1.057,1.1028,1.186,1.208,1.235,1.262,1.29,1.376,1.722,2. /          JOV=COMP
00221          DATA XJOV9 / 20*0. /                                                 JOV=9
00222          DATA XJOV10 / 20*0. /                                                JOV=10
00223          DATA XJP1 / .777,.795,.807,.824,.834,.846,.866,.904,.93,.956,1.,     JP=1
00224         1 1.046,1.1,1.145,1.196,1.294,1.429,1.568,1.715,1.9 /                 JP=1
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00225          DATA XJP2 / .754,.771,.797,.816,.828,.84,.86,.881,1.,1.026,1.062,  JP=2
00226         1 1.104,1.17,1.28,1.45,1.737,2.,2.001,2.002,2.003 /                 JP=2
00227          DATA XJP3 / .704,.728,.752,.776,.796,.81,.908,1.,1.012,1.036,      JP=3
00228         1 1.066,1.124,1.194,1.33,1.574,2.,2.001,2.002,2.003,2.004 /         JP=3
00229          DATA XJP4 / .62,.688,.71,.734,.764,.786,.802,.898,1.,1.016,        JP=4
00230         1 1.042,1.076,1.134,1.214,1.283,1.628,2.,2.001,2.002,2.003 /        JP=4
00231          DATA XJP5 / .64,.7,.71,.722,.78,.858,.949,1.,1.05,1.088,1.12,      JP=COMP
00232         1 1.22,1.324,1.474,2.,2.001,2.002,2.003,2.004,2.005 /               JP=COMP
00233          DATA XJP6 / 20*0. /                                                JP=6
00234          DATA XJP7 / 20*0. /                                                JP=7
00235          DATA XJP8 / 20*0. /                                                JP=8
00236          DATA XJP9 / 20*0. /                                                JP=9
00237          DATA XJP10 / 20*0. /                                               JP=10
00238          DATA XJS1 / .677,.898,.913,.92,.925,.934,.94,.944,.96,1.,1.045,    JS=1
00239         1 1.071,1.073,1.078,1.086,1.099,1.1,1.101,1.102,1.103 /             JS=1
00240          DATA XJS2 / .876,.889,.908,.919,.933,.946,.959,.962,.984,1.,       JS=2
00241         1 1.021,1.026,1.036,1.066,1.113,1.149,1.215,1.216,1.217,1.218 /     JS=2
00242          DATA XJS3 / .784,.8,.832,.85,.874,.923,1.,1.067,1.12,1.128,1.14,   JS=3
00243         1 1.162,1.193,1.44,1.73,2.,2.001,2.002,2.003,2.004 /                JS=3
00244          DATA XJS4 / .732,.748,.76,.81,.843,.912,1.,1.048,1.067,1.111,      JS=4
00245         1 1.172,1.228,1.312,1.371,1.6,1.8,2.,2.001,2.002,2.003 /            JS=4
00246          DATA XJS5 / .678,.698,.72,.75,.778,.805,.83,.844,.852,.94,1.,      JS=5
00247         1 1.04,1.104,1.131,1.174,1.238,1.291,1.41,1.6,2. /                  JS=5
00248          DATA XJS6 / .72,.74,.756,.766,.774,.875,1.,1.052,1.091,1.134,      JS=6
00249         1 1.19,1.263,1.369,1.492,1.651,1.851,2.,2.001,2.002,2.003 /         JS=6
00250          DATA XJS7 / .6,.625,.646,.698,.76,.791,.829,.922,1.,1.04,1.097,    JS=7
00251         1 1.176,1.282,1.408,1.555,2.,2.001,2.002,2.003,2.004 /              JS=7
00252          DATA XJS8 / .751,.774,.794,.816,.834,.846,.92,1.,1.044,1.118,      JS=COMP
00253         1 1.164,1.222,1.28,1.345,1.494,1.724,2.,2.001,2.002,2.003 /         JS=COMP
00254          DATA XJS9 / 20*0. /                                                JS=9
00255          DATA XJS10 / 20*0. /                                               JS=10
00256          DATA YTAB1 / 1.,.993,.987,.978,.96,.94,.92,.9,.8,.69,.5,.3,.08,    TAB=1
00257         1 .06,.043,.033,.026,.023,.011,0. /                                 TAB=1
00258          DATA YTAB2 / 1.,.997,.993,.987,.977,.963,.948,.9,.8,.675,.5,.3,    TAB=2
00259         1 .24,.18,.099,.06,.04,.026,.018,0. /                               TAB=2
00260          DATA YTAB3 / 1.,.997,.994,.981,.96,.92,.88,.635,.5,.279,.148,.1,   TAB=3
00261         1 .068,.046,.025,.016,4*0. /                                        TAB=3
00262          DATA YTAB4 / 1.,.993,.991,.983,.972,.962,.939,.887,.817,.5,.246,   TAB=4
00263         1 .195,.145,.103,.073,.04,.015,3*0. /                               TAB=4
00264          DATA YTAB5 / 1.,.994,.987,.968,.932,.9,.8,.5,.2,.135,.099,.066,    TAB=5
00265         1 .052,.04,.026,.021,4*.02 /                                        TAB=5
00266          DATA YTAB6 / 1.,.977,.941,.908,.862,.823,.758,.5,.42,.375,.3,      TAB=6
00267         1 .237,.1,.08,.06,.04,.03,3*.02 /                                   TAB=6
00268          DATA YTAB7 / 1.,.998,.992,.981,.969,.947,.919,.9,.8,.5,.4,.339,    TAB=7
00269         1 .292,.243,.219,.177,4*.12 /                                       TAB=7
00270          DATA YTAB8 / 1.,.998,.994,.982,.97,.952,.9,.88,.82,.5,.3,.237,     TAB=COMP
00271         1 .2,.106,.08,.068,.06,.048,2*.022 /                                TAB=COMP
00272          DATA YTAB9 / 20*0. /                                               TAB=9
00273          DATA YTAB10 / 20*0. /                                              TAB=10
00274          DATA YDMV1 / 1.,.997,.993,.98,.7,.5,.26,.012,.006,.003,.001,       DMV=1
00275         1 9*0. /                                                            DMV=1
00276          DATA YDMV2 / 1.,.989,.977,.959,.945,.919,.8,.5,.4,.21,.04,.027,    DMV=2
00277         1 .013,.005,6*0. /                                                  DMV=2
00278          DATA YDMV3 / 1.,.993,.978,.962,.94,.906,.844,.7,.5,.288,.068,      DMV=3
00279         1 .048,.03,.015,.009,5*0. /                                         DMV=3
00280          DATA YDMV4 / 1.,.993,.987,.976,.954,.86,.7,.5,.247,.046,.025,      DMV=4
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     1 .013,.007,.001,6*0. /                                                DMV=4
      DATA YDMV5 / 1.,.997,.991,.975,.956,.931,.899,.88,.69,.5,.3,           DMV=5
     1 .208,.16,.12,.071,.04,.02,.006,.002,0. /                              DMV=5
      DATA YDMV6 / 1.,.997,.991,.98,.941,.9,.735,.5,.267,.18,.12,.05,        DMV=COMP
     1 .021,.007,.003,5*0. /                                                 DMV=COMP
      DATA YDMV7 / 20*0. /                                                   DMV=7
      DATA YDMV8 / 20*0. /                                                   DMV=8
      DATA YDMV9 / 20*0. /                                                   DMV=9
      DATA YDMV10 / 20*0. /                                                  DMV=10
      DATA YDMC1 / 1.,.997,.99,.983,.978,.964,.5,.089,.054,.04,.03,          DMC=1
     1 .02,.012,.006,.002,5*0. /                                             DMC=1
      DATA YDMC2 / 1.,.997,.991,.985,.978,.97,.952,.75,.5,.167,.09,.04,      DMC=2
     1 .029,.019,.008,.002,4*0. /                                            DMC=2
      DATA YDMC3 / 1.,.992,.987,.982,.973,.968,.937,.812,.5,.266,.056,       DMC=3
     1 .048,.034,.02,.01,.005,4*0. /                                         DMC=3
      DATA YDMC4 / 1.,.999,.998,.996,.988,.979,.921,.763,.5,.303,.113,       DMC=4
     1 .088,.062,.041,.024,.01,.006,3*0. /                                   DMC=4
      DATA YDMC5 / 1.,.997,.994,.986,.969,.951,.928,.900,.860,.70,.5,        DMC=5
     1 .200,.156,.1,.073,.05,.029,.016,.006,0. /                             DMC=5
      DATA YDMC6 / 1.,.996,.988,.983,.958,.937,.917,.868,.831,.684,.5,       DMC=6
     1 .243,.17,.133,.089,.055,.036,.014,2*0. /                              DMC=6
      DATA YDMC7 / 1.,.992,.985,.98,.975,.964,.96,.95,.75,.5,.25,            DMC=COMP
     1 .197,.14,.1,.06,.04,.02,.01,2*0. /                                    DMC=COMP
      DATA YDMC8 / 20*0. /                                                   DMC=8
      DATA YDMC9 / 20*0. /                                                   DMC=9
      DATA YDMC10 / 20*0. /                                                  DMC=10
      DATA YHC1 / 1.,.991,.965,.93,.89,.857,.793,.758,.702,.5,.44,           HC=1
     1 .339,.153,.109,.074,.034,.017,.007,.003,0. /                          HC=1
      DATA YHC2 / 1.,.962,.908,.835,.768,.646,.5,.4,.298,.247,.175,          HC=2
     1 .115,.07,.048,.029,.012,.004,3*0. /                                   HC=2
      DATA YHC3 / 1.,.981,.965,.939,.905,.791,.678,.595,.5,.332,.277,        HC=3
     1 .221,.145,.095,.067,.053,.035,.017,.003,0. /                          HC=3
      DATA YHC4 / 1.,.989,.968,.941,.925,.881,.806,.713,.64,.5,.326,         HC=4
     1 .279,.2,.14,.063,.041,.03,.011,2*0. /                                 HC=4
      DATA YHC5 / 1.,.995,.983,.954,.886,.858,.814,.769,.735,.5,.297,        HC=5
     1 .094,.078,.049,.033,.024,.02,.017,.012,0. /                           HC=5
      DATA YHC6 / 1.,.999,.994,.954,.91,.891,.873,.838,.793,.5,.381,         HC=6
     1 .313,.246,.121,.093,.069,.053,.021,.009,0. /                          HC=6
      DATA YHC7 / 1.,.985,.89,.876,.863,.844,.5,.44,.4,.361,.321,.295,       HC=7
     1 .23,.205,.193,.179,.157,.123,2*.1 /                                   HC=7
      DATA YHC8 / .936,.903,.863,.812,.761,.5,.433,.396,.353,.304,.273,      HC=COMP
     1 .244,.216,.189,.163,.142,.126,3*.116 /                                HC=COMP
      DATA YHC9 / 20*0. /                                                    HC=9
      DATA YHC10 / 20*0. /                                                   HC=10
      DATA YFF1 / 20*0.8 /                                                   FF=1
      DATA YFF2 / 20*0.8 /                                                   FF=2
      DATA YFF3 / 20*0. /                                                    FF=3
      DATA YFF4 / 20*0. /                                                    FF=4
      DATA YFF5 / 20*0. /                                                    FF=5
      DATA YFF6 / 20*0. /                                                    FF=6
      DATA YFF7 / 20*0. /                                                    FF=7
      DATA YFF8 / 20*0. /                                                    FF=8
      DATA YFF9 / 20*0. /                                                    FF=9
      DATA YFF10 / 20*0. /                                                   FF=10
      DATA YJOV1 / 1.,.997,.987,.979,.88,.699,.5,.223,.08,.064,.047,         JOV=1
     1 .032,.019,.006,.003,5*0. /                                            JOV=1
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00337          DATA YJOV2 / 1.,.998,.99,.907,.869,.814,.75,.5,.3,.25,.201,.169,   JOV=2
00338         1 .129,.097,.083,.075,.035,3*0. /                                    JOV=2
00339          DATA YJOV3 / 1.,.997,.991,.977,.967,.955,.699,.5,.299,.131,.113,   JOV=3
00340         1 .093,.075,.065,.057,.034,.015,3*0. /                               JOV=3
00341          DATA YJOV4 / 1.,.997,.989,.971,.945,.922,.681,.5,.275,.255,.229,   JOV=4
00342         1 .197,.169,.145,.115,.086,.061,3*.04 /                              JOV=4
00343          DATA YJOV5 / 1.,.995,.985,.97,.952,.931,.899,.733,.5,.366,.255,    JOV=5
00344         1 .217,.194,.168,.142,.114,.088,.062,.028,0. /                       JOV=5
00345          DATA YJOV6 / 1.,.996,.99,.98,.969,.937,.84,.739,.5,.397,.369,      JOV=6
00346         1 .337,.297,.25,.119,.089,.064,.038,.018,.01 /                       JOV=6
00347          DATA YJOV7 / 1.,.998,.99,.975,.948,.925,.873,.702,.5,.422,.4,      JOV=7
00348         1 .376,.343,.298,.267,.229,.193,3*.143 /                             JOV=7
00349          DATA YJOV8 / 1.,.997,.989,.98,.968,.953,.937,.76,.5,.415,.333,     JOV=COMP
00350         1 .250,.14,.118,.1,.086,.076,.056,.032,.02 /                         JOV=COMP
00351          DATA YJOV9 / 20*0. /                                                JOV=9
00352          DATA YJOV10 / 20*0. /                                               JOV=10
00353          DATA YJP1 / 1.,.995,.988,.97,.955,.932,.829,.693,.621,.57,.5,      JP=1
00354         1 .437,.38,.345,.316,.273,.233,.198,.168,.132 /                      JP=1
00355          DATA YJP2 / 1.,.999,.993,.98,.962,.839,.747,.694,.5,.465,.433,     JP=2
00356         1 .4,.362,.309,.243,.149,4*.068 /                                    JP=2
00357          DATA YJP3 / 1.,.998,.993,.982,.969,.947,.713,.5,.482,.458,.433,    JP=3
00358         1 .396,.36,.306,.232,5*.12 /                                         JP=3
00359          DATA YJP4 / 1.,.996,.989,.976,.949,.921,.9,.705,.5,.48,.455,.43,   JP=4
00360         1 .398,.362,.338,.253,4*.185 /                                       JP=4
00361          DATA YJP5 / 1.,.993,.988,.97,.84,.7,.56,.5,.449,.416,.391,.335,    JP=COMP
00362         1 .293,.247,6*.128 /                                                 JP=COMP
00363          DATA YJP6 / 20*0. /                                                 JP=6
00364          DATA YJP7 / 20*0. /                                                 JP=7
00365          DATA YJP8 / 20*0. /                                                 JP=8
00366          DATA YJP9 / 20*0. /                                                 JP=9
00367          DATA YJP10 / 20*0. /                                                JP=10
00368          DATA YJS1 / 1.,.993,.981,.974,.967,.951,.935,.919,.799,.5,.2,       JS=1
00369         1 .039,.033,.02,.009,5*0. /                                          JS=1
00370          DATA YJS2 / 1.,.996,.977,.964,.941,.911,.864,.852,.642,.5,.304,     JS=2
00371         1 .274,.241,.176,.109,.067,4*0. /                                    JS=2
00372          DATA YJS3 / 1.,.999,.991,.983,.958,.779,.5,.279,.121,.106,.092,     JS=3
00373         1 .079,.069,.039,.021,5*.01 /                                        JS=3
00374          DATA YJS4 / 1.,.996,.985,.919,.86,.7,.5,.392,.363,.321,.281,        JS=4
00375         1 .252,.218,.199,.138,.094,4*.055 /                                  JS=4
00376          DATA YJS5 / 1.,.997,.993,.985,.973,.957,.935,.916,.899,.66,.5,      JS=5
00377         1 .423,.313,.283,.252,.214,.191,.149,.109,.063 /                     JS=5
00378          DATA YJS6 / 1.,.995,.988,.98,.969,.759,.5,.4,.341,.291,.241,        JS=6
00379         1 .195,.15,.117,.095,.08,4*.075 /                                    JS=6
00380          DATA YJS7 / 1.,.995,.985,.947,.897,.865,.825,.641,.5,.449,.405,     JS=7
00381         1 .363,.321,.283,.248,5*.16 /                                        JS=7
00382          DATA YJS8 / 1.,.997,.992,.982,.969,.954,.735,.5,.404,.277,.237,     JS=COMP
00383         1 .201,.175,.15,.108,.062,4*.02 /                                    JS=COMP
00384          DATA YJS9 / 20*0. /                                                 JS=9
00385          DATA YJS10 / 20*0. /                                                JS=10
00386          IF (X.GT.XDATA(1,I1,L)) GO TO 1
00387          Y=YDATA(1,I1,L)
00388          RETURN
00389        1 IF (X.LT.XDATA(20,I1,L)) GO TO 2
00390          Y=YDATA(20,I1,L)
00391          RETURN
00392        2 DO 3 I=1,20
```

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00393          XUSED(I)=XDATA(I,I1,L)
00394        3 YUSED(I)=YDATA(I,I1,L)
00395          Y=YINTRP(XUSED,YUSED,X,20)
00396          RETURN
00397          END
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EQUIVALENCED VARIABLES

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XTAB1	1#R	XDATA	1#R	XTAB2	25#R	XTAB3	51#R	XTAB4	75#R
XTAB5	121#R	XTAB6	145#R	XTAB7	171#R	XTAB8	215#R	XTAB9	241#R
XTAB10	265#R	XDMV1	311#R	XDMV2	335#R	XDMV3	361#R	XDMV4	405#R
XDMV5	431#R	XDMV6	455#R	XDMV7	501#R	XDMV8	525#R	XDMV9	551#R
XDMV10	575#R	XDMC1	621#R	XDMC2	645#R	XDMC3	671#R	XDMC4	715#R
XDMC5	741#R	XDMC6	765#R	XDMC7	1011#R	XDMC8	1035#R	XDMC9	1061#R
XDMC10	1105#R	XHC1	1131#R	XHC2	1155#R	XHC3	1201#R	XHC4	1225#R
XHC5	1251#R	XHC6	1275#R	XHC7	1321#R	XHC8	1345#R	XHC9	1371#R
XHC10	1415#R	XJOV1	1441#R	XJOV2	1465#R	XJOV3	1511#R	XJOV4	1535#R
XJOV5	1561#R	XJOV6	1605#R	XJOV7	1631#R	XJOV8	1655#R	XJOV9	1701#R
XJOV10	1725#R	XJP1	1751#R	XJP2	1775#R	XJP3	2021#R	XJP4	2045#R
XJP5	2071#R	XJP6	2115#R	XJP7	2141#R	XJP8	2165#R	XJP9	2211#R
XJP10	2235#R	XJS1	2261#R	XJS2	2305#R	XJS3	2331#R	XJS4	2355#R
XJS5	2401#R	XJS6	2425#R	XJS7	2451#R	XJS8	2475#R	XJS9	2521#R
XJS10	2545#R	XFF1	2571#R	XFF2	2615#R	XFF3	2641#R	XFF4	2665#R
XFF5	2711#R	XFF6	2735#R	XFF7	2761#R	XFF8	3005#R	XFF9	3031#R
XFF10	3055#R								

)

(

YTAB1	3101#R	YDATA	3101#R	YTAB2	3125#R	YTAB3	3151#R	YTAB4	3175#R
YTAB5	3221#R	YTAB6	3245#R	YTAB7	3271#R	YTAB8	3315#R	YTAB9	3341#R
YTAB10	3365#R	YDMV1	3411#R	YDMV2	3435#R	YDMV3	3461#R	YDMV4	3505#R
YDMV5	3531#R	YDMV6	3555#R	YDMV7	3601#R	YDMV8	3625#R	YDMV9	3651#R
YDMV10	3675#R	YDMC1	3721#R	YDMC2	3745#R	YDMC3	3771#R	YDMC4	4015#R
YDMC5	4041#R	YDMC6	4065#R	YDMC7	4111#R	YDMC8	4135#R	YDMC9	4161#R
YDMC10	4205#R	YHC1	4231#R	YHC2	4255#R	YHC3	4301#R	YHC4	4325#R
YHC5	4351#R	YHC6	4375#R	YHC7	4421#R	YHC8	4445#R	YHC9	4471#R
YHC10	4515#R	YJOV1	4541#R	YJOV2	4565#R	YJOV3	4611#R	YJOV4	4635#R
YJOV5	4661#R	YJOV6	4705#R	YJOV7	4731#R	YJOV8	4755#R	YJOV9	5001#R
YJOV10	5025#R	YJP1	5051#R	YJP2	5075#R	YJP3	5121#R	YJP4	5145#R
YJP5	5171#R	YJP6	5215#R	YJP7	5241#R	YJP8	5265#R	YJP9	5311#R
YJP10	5335#R	YJS1	5361#R	YJS2	5405#R	YJS3	5431#R	YJS4	5455#R
YJS5	5501#R	YJS6	5525#R	YJS7	5551#R	YJS8	5575#R	YJS9	5621#R
YJS10	5645#R	YFF1	5671#R	YFF2	5715#R	YFF3	5741#R	YFF4	5765#R
YFF5	6011#R	YFF6	6035#R	YFF7	6061#R	YFF8	6105#R	YFF9	6131#R
YFF10	6155#R								

)

SUBPROGRAMS CALLED

YINTRP

SCALARS AND ARRAYS ("*" NO EXPLICIT DECLARATION - "X" NOT REFERENCED - "#" SUBSCRIPTED)

YHC4	4325#R	XJP8	2165#R	XDMC8	1035#R	YTAB6	3245#R	YJOV4	4635#R
XJP10	2235#R	YDATA	3101#R	YFF5	6011#R	YDMC6	4065#R	XHC6	1275#R
XJP1	1751#R	XDMV3	361#R	XUSED	6201#R	YJOV9	5001#R	XFF7	2761#R

```
 YJS4     5455#R        YDMV1    3411#R        YJP5     5171#R        XDMV8     525#R        XTAB2      25#R
 XJS6     2425#R        XJOV10   1725#R        YDMC2     645#R        YHC3     4301#R        YDMV6    3555#R
 XJP7     2141#R        YTAB10   3365#R        XTAB7     171#R        XJOV5    1561#R        YFF8     5765#R
 YDMC10   4205#R        XHC5     1251#R        XDMC7    1011#R        YTAB5    3221#R        YJOV3    4611#R
 YDMC5    4041#R        XFF6     2735#R        YHC9     4471#R        YJS3     5431#R        XDMV2     335#R
 YJP4     5145#R        YJOV8    4755#R        XJS5     2401#R        YHC2     4255#R        YDMV10   3675#R
 XJP6     2115#R        XDMV7     501#R        XTAB1       1#R        XDMC1     621#R        YJS9     5621#R
 YFF3     5741#R        YDMV5    3531#R        XHC4     1225#R        XTAB6     145#R        XJOV4    1535#R
 XDATA       1#R        XFF5     2711#R        XDMC6     765#R       *Y        6225 R        YHC8     4445#R
 YTAB4    3175#R        YJS2     5405#R        YJOV2    4565#R        YJP3     5121#R        YHC10    4515#R
 YDMC4    4015#R        XJOV9    1701#R        YFF9     6131#R        YTAB9    3341#R        XJS4     2355#R
 XDMV1     311#R        YJOV7    4731#R        YHC1     4231#R        XJP5     2071#R        YDMC9    4161#R
 YJS8     5575#R        YFF2     5715#R        XHC3     1201#R        XDMV6     455#R        YJP9     5311#R
 XTAB10    265#R        YJS10    5645#R        YDMV4    3505#R        XFF4     2665#R        XDMC10   1105#R
 YHC7     4421#R        XTAB5     121#R        YJS1     5361#R        XJOV3    1511#R        YJP2     5075#R
 XDMC5     741#R        YFF8     6105#R        YDMV9    3651#R        YTAB3    3151#R        XHC9     1371#R
 YJOV1    4541#R        XJS3     2331#R        YFF10    6155#R        YDMC3    3771#R        XJP4     2045#R
 XJOV8    1655#R        YTAB8    3315#R        YJS7     5551#R        YJOV6    4705#R        YFF1     5671#R
 XHC2     1155#R        XDMV10    575#R        YJP8     5265#R        YDMC8    4135#R        YJP10    5335#R
 XJS9     2521#R        XFF3     2641#R        XDMV5     431#R        YHC6     4375#R        YJP1     5051#R
 YDMV3    3461#R       *X        6226 R        YU8ED    6227#R        YFF7     6061#R        XHC8     1345#R
 XTAB4      75#R        XJS2     2305#R        XJOV2    1465#R        XJP3     2021#R        XHC10    1415#R
 XDMC4     715#R        YDMV8    3625#R        YTAB2    3125#R        XFF9     3031#R        XTAB9     241#R
 YJS6     5525#R        YJOV10   5025#R        YDMC2    3745#R        XJOV7    1631#R        XHC1     1131#R
 YJP7     5241#R        XDMC9    1061#R        YTAB7    3271#R       *L        6253 I        YJOV5    4061#R
 XJS8     2475#R        XFF2     2615#R       *I        6254 I        *I        6255 I        YHC5     4351#R
 YDMC7    4111#R        XJP9     2211#R        XJS10    2545#R        XDMV4     405#R        YFF6     6035#R
 XHC7     1321#R        XJS1     2261#R        YDMV2    3435#R        XJP2     1775#R        XFF8     3005#R
 XDMV9     551#R        XTAB3      51#R        XJOV1    1441#R        YJS5     5501#R        XFF10    3055#R
 XDMC3     671#R        YJP6     5215#R        YDMV7    3601#R        YTAB1    3101#R        XTAB8     215#R
 YDMC1    3721#R        XJS7     2451#R        XJOV6    1605#R        XFF1     2571#R

TEMPORARIES

 .80000   6256 I        .A0016   6257 R        .A0002   6260 R        .A0003   6261 R        .A0004   6262 R


LINE NUMBER/OCTAL LOCATION MAP

       ! 0       1       2       3       4       5       6       7       8       9
-------!-------------------------------------------------------------------------------
       !
00000 ! -       0       -       -       -       -       -       -       -       -
00010 ! -       -       -       -       -       -       -       -       -       -
00020 ! -       -       -       -       -       -       -       -       -       -
00030 ! -       -       -       -       -       -       -       -       -       -
00040 ! -       -       -       -       -       -       -       -       -       -
00050 ! -       -       -       -       -       -       -       -       -       -
00060 ! -       -       -       -       -       -       -       -       -       -
00070 ! -       -       -       -       -       -       -       -       -       -
00080 ! -       -       -       -       -       -       -       -       -       -
00090 ! -       -       -       -       -       -       -       -       -       -
00100 ! -       -       -       -       -       -       -       -       -       -
00110 ! -       -       -       -       -       -       -       -       -       -
```

```
Y       Y.F4    FORTRAN V.5A(563) /KI   6-OCT-77        12:34   PAGE 1-9

00120 ! -
00130 ! -
00140 ! -
00150 ! -
00160 ! -
00170 ! -
00180 ! -
00190 ! -
00200 ! -
00210 ! -
00220 ! -
00230 ! -
00240 ! -
00250 ! -
00260 ! -
00270 ! -
00280 ! -
00290 ! -
00300 ! -
00310 ! -
00320 ! -
00330 ! -
00340 ! -
00350 ! -
00360 ! -
00370 ! -
00380 ! -
00390 ! 37      45      46      47      57      70      12      20      26      27
                                                        -       72

Y       OCTAL PROG SIZE=6373  ( SCALARS/ARRAYS=6255 + TEMPS/CONS=7 + CODE=102 + ARGS=5 )
( NO ERRORS DETECTED )
```

```
00001         FUNCTION YINTRP(XPTS,YPTS,X,N)
00002     C ***************************************************************************
00003     C LAGRANGIAN INTERPOLATION ROUTINE                                          *
00004     C                                                                           *
00005     C THE X-VALUES MUST BE MONOTONICALLY NONDECREASING                          *
00006     C ***************************************************************************
00007         DIMENSION XPTS(N),YPTS(N)
00008         N1=N-1
00009         IF (X.GT.XPTS(1)) GO TO 1
00010     C X VALUE TOO LOW - SET Y EQUAL TO YPTS(1)
00011         YINTRP=YPTS(1)
00012         RETURN
00013       1 IF (X.LT.XPTS(N)) GO TO 2
00014     C X VALUE TOO HIGH - SET Y EQUAL TO YPTS(N)
00015         YINTRP=YPTS(N)
00016         RETURN
00017       2 IF (X.GT.XPTS(2)) GO TO 3
00018     C LINEAR INTERPOLATION BETWEEN FIRST 2 POINTS
00019         YINTRP=YPTS(1)+(X-XPTS(1))*(YPTS(2)-YPTS(1))/(XPTS(2)-XPTS(1))
00020         RETURN
00021       3 IF (X.LT.XPTS(N1)) GO TO 4
00022     C LINEAR INTERPOLATION BETWEEN LAST 2 POINTS
00023         YINTRP=YPTS(N1)+(X-XPTS(N1))*(YPTS(N)-YPTS(N1))/(XPTS(N)-XPTS(N1))
00024         RETURN
00025     C FIND INTERVAL CONTAINING X   (X WILL BE BETWEEN XPTS(K) AND XPTS(K+1))
00026       4 DO 5 I=3,N1
00027         IF (X.GT.XPTS(I)) GO TO 5
00028         K=I-1
00029         GO TO 6
00030       5 CONTINUE
00031         YINTRP=1.E+38
00032         RETURN
00033     C TEST FOR INVERSE INTERPOLATION
00034       6 IF (X.GE.10.) GO TO 60
00035     C TEST FOR DISTINCT X-VALUES
00036         IF ((XPTS(K-1).LT.XPTS(K)).AND.(XPTS(K+1).LT.XPTS(K+2))) GO TO 7
00037     C ***************************************************************************
00038     C LINEAR INTERPOLATION THROUGH XPTS(K) AND XPTS(K+1)                        *
00039     C ***************************************************************************
00040      60 YINTRP=YPTS(K)+(X-XPTS(K))*(YPTS(K+1)-YPTS(K))/(XPTS(K+1)-XPTS(K))
00041         RETURN
00042     C ***************************************************************************
00043     C LAGRANGE INTERPOLATION THROUGH XPTS(K-1), XPTS(K), XPTS(K+1) AND          *
00044     C XPTS(K+2)                                                                 *
00045     C ***************************************************************************
00046       7 YSUM=0.
00047         K1=K-1
00048         K2=K+2
00049         DO 9 I=K1,K2
00050         XNUM=1.
00051         XDENOM=1.
00052         DO 8 J=K1,K2
00053         IF (I.EQ.J) GO TO 8
00054         XNUM=XNUM*(X-XPTS(J))
00055         XDENOM=XDENOM*(XPTS(I)-XPTS(J))
00056       8 CONTINUE
```

```
YINTRP  YINTRP,F4       FORTRAN V,5A(563) /KI   6-OCT-77        12:35   PAGE 1-1

00057           YSUM=YSUM+(XNUM/XDENOM)*YPTS(I)
00058         9 CONTINUE
00059           YINTRP=YSUM
00060     C TEST FOR MONOTONICITY OF Y-VALUES
00061           IF ((YPTS(K-1).LE.YPTS(K)).AND.(YPTS(K).LE.YPTS(K+1)).AND.
00062          1 (YPTS(K+1).LE.YPTS(K+2))) GO TO 10
00063           IF ((YPTS(K-1).GE.YPTS(K)).AND.(YPTS(K).GE.YPTS(K+1)).AND.
00064          1 (YPTS(K+1).GE.YPTS(K+2))) GO TO 10
00065           RETURN
00066     C Y-VALUES ARE MONOTONIC -
00067     C TEST FOR EXCESSIVE CURVATURE IN INTERPOLATING POLYNOMIAL
00068        10 IF (YSUM.GT.AMAX1(YPTS(K),YPTS(K+1))) GO TO 60
00069           IF (YSUM.LT.AMIN1(YPTS(K),YPTS(K+1))) GO TO 60
00070           RETURN
00071           END


SUBPROGRAMS CALLED

AMAX1,  AMIN1,

SCALARS AND ARRAYS ( "*" NO EXPLICIT DECLARATION - "%" NOT REFERENCED - "#" SUBSCRIPTED )

*N1          1 I        *N           2 I        *YINTRP      3 R        *K1          4 I        *K           5 I
*YSUM        6 R        *XDENOM      7 R        *XNUM       10 R        *J          11 I         YPTS       12#R
*X          13 R        *I          14 I         XPTS       15#R        *K2         16 I

TEMPORARIES

 .I0000     17 I        .I0001      20 I        .I0002      21 I        .I0003      22 I        .B0000      23 I
 .B0001     24 I        .B0002      25 I        .A0016      26 R        .A0002      27 R        .A0003      30 R
 .A0004     31 R        .A0005      32 R        .A0006      33 R

LINE NUMBER/OCTAL LOCATION MAP

      ! 0       1       2       3       4       5       6       7       8       9
------!-------------------------------------------------------------------------------
      !
00000 ! -       0       -       -       -       -       -       -      22      25
00010 ! -      31      34      35       -      42      46      47       -      53
00020 ! 66     67       -      74      116      -      117     123     130     133
00030 ! 134    136     140      -      141      -      144      -       -       -
00040 ! 154    172      -       -       -       -      173     174     177     202
00050 ! 210    212     213     217     222     227     235     237     245     250
00060 ! -      252      -      265      -      277      -       -      300     307
00070 ! -      316

YINTRP  OCTAL PROG SIZE=402  ( SCALARS/ARRAYS=16 + TEMPS/CONS=17 + CODE=327 + ARGS=16 )
( NO ERRORS DETECTED )
```

7.4 Instructions for Data Preparation

In order to simulate the performance of a given plant configuration the user must provide the following information:

1. The number of units in the plant.
2. The number of flowstreams in the plant.
3. The number of size increments in the feed stream.
4. The number of specific gravity increments in the feed stream.
5. The level of information (degree of detail) to be provided by the simulator.
6. The maximum number of iterations (trial-and-error calculations) for a plant that contains one or more retreatment streams.
7. The manner with which the washability calculations will be carried out (by size increments or composite).
8. The level of information to be printed in each washer unit summary.
9. For each major plant component (unit), the type of unit and the appropriate unit settings ("decision variables").
10. The origin and destination of each flowstream.
11. The boundaries of the size increments for the feed stream.
12. The weight percent of coal within each size increment.
13. The boundaries of the specific gravity increments for the feed stream.
14. Parameters for calculating the BTU content of the coal.
15. The specific gravity analysis for the feed stream (i.e., the distribution of weight, ash, pyritic sulfur and total sulfur).

Some of these items can be provided by single numerical values. For others, arrays of data will be required.

Instructions for preparing the input data on punched cards are given below. Standard FORTRAN formats are shown for each card or set of cards.

(See the sample plant configuration and sample set of input data presented elsewhere in this report.)

Note: All I-field entries are right-adjusted

All A-field entries are left-adjusted

I. TITLE CARD (Format: 20A4)

Title Card - may contain any desired descriptive information. (This card must be present even if blank).

II. PROGRAM PARAMETERS (Format: 26I3)

NUNITS, NFLOWS, NSIZE, NGRAV, IOUT, ICMAX, NCOMP, PSJ

where

NUNITS is the number of units in the plant configuration.

NFLOWS is the number of flowstreams in the plant configuration (cannot exceed 20).

NSIZE is the number of size increments for the feed (cannot exceed 23).

NGRAV is the number of specific gravity increments for the feed (cannot exceed 10).

IOUT designates the output level.

IOUT = 0 (blank) causes the printing of the specific gravity analysis of the feed stream and an overall plant summary.

IOUT = 1 causes the printing of the specific gravity analyses of the feed and product streams, summary data for each unit and an overall plant summary.

IOUT = 2 causes the printing of the specific gravity analyses of all flowstreams, summary data for each unit and an overall plant summary.

ICMAX is the maximum number of iterations for a plant configuration containing retreatment streams. (Automatically set equal to 50 if left blank.)

NCOMP indicates how the separations will be determined

NCOMP = 0 (blank) causes each separation to be computed by size increments using a different separation for each size increment.

NCOMP = 1 causes the entire separation to be computed using a single separation curve.

III. UNIT DESIGNATIONS (Format: I3, 2X, F5.3, 2X, F5.3, 2X, F5.3)

L(I), D1(I), D2(I), D3(I) (one card per unit)

where L(I) designates the type of the ith unit

L = 1: Concentrating Table
L = 2: Dense-Medium Vessel
L = 3: Dense-Medium Cyclone
L = 4: Hydrocyclone
L = 5: Single-Stage Baum Jig
L = 6: 2-Stage Baum Jig
L = 7: Froth Flotation Cell

L = 11: Rotary Breaker
L = 12: Primary Multiple Roll Crusher
L = 13: Primary Gyratory/Jaw Crusher
L = 14: Primary Single Roll Crusher
L = 15: Primary Cage Mill Crusher
L = 16: Secondary Multiple Roll Crusher
L = 17: Secondary Gyratory/Jaw Crusher
L = 18: Secondary Single Roll Crusher
L = 19: Secondary Cage Mill Crusher

L = 21: Dry Upper Screen (or Single Dry Screen)
L = 22: Dry Lower Screen
L = 23: Wet Upper Screen (or Single Wet Screen)
L = 24: Wet Lower Screen

L = 41: Stream Blender

L = 51: Stream Splitter

D1(I) - D3(I) represent the decision variables for the respective units as follows:

Washers:
D1 = Specific gravity of separation
D2 = Blank
D3 = Blank

Rotary Breaker:
D1 = Length (feet)
D2 = Diameter (feet)
D3 = Screen size (inches)
(D3 should be assigned a value of either 6 or 8 inches)

Crushers:	D1 = Crusher setting (inches) D2 = Blank D3 = Blank
Screens:	D1 = Screen size (inches) D2 = Blank D3 = Blank
Splitter:	D1 = Percent feed diverted to overflow stream D2 = Blank D3 = Blank
Blender:	D1 = Blank D2 = Blank D3 = Blank

Note: The units must be specified in the same order that the calculations will be carried out.

All units will have one input stream and two output streams, with the following exceptions

1. 2-Stage Baum Jig (L = 6)
   One input stream, three output streams

2. Crushers (L = 12, 13, 14, 15, 16, 17, 18, or 19)
   One input stream, one output stream

3. Stream Blender (L = 41)
   Two input streams, one output stream

IV. FLOWSTREAM DESIGNATIONS (Format: 2I3, 2X, A1)

KF(1,J), KF(2,J), S(J) (One card per flowstream)

where

KF(1,J) — designates the index (I) of the unit from which the jth flowstream originates.
(0 indicates feed into the plant).

KF(2,J) — designates the index (I) of the unit which is the destination of the jth flowstream.
(0 indicates a product leaving the plant).

S(J) — is the symbol for a stream leaving a unit

(blank)	indicates a feed stream entering the Ith unit
C	indicates a clean coal stream leaving the Ith unit
M	indicates a middlings stream leaving the Ith unit (2-stage jig)
R	indicates a refuse stream leaving the Ith unit
U	indicates an upper (overflow) stream leaving the Ith unit (screens or splitter)
L	indicates a lower (underflow) stream leaving the Ith unit (screens or splitter)

For those units that have only one exit stream (e.g. crushers, blender), a stream symbol is not required (leave blank).

V. SIZE BOUNDARIES (Format: 8(6A1, 4X))

SYMBOL(1), SYMBOL(2),.....,SYMBOL(NSIZE + 1)

where SYMBOL(1) = the lower size boundary for the first size increment, in inches or mesh size.

SYMBOL(2) = the upper size boundary for the first size increment (inches or mesh).

SYMBOL(3) = the upper size boundary for the second size increment (inches or mesh).

.

.

.

SYMBOL(NSIZE+1) = the upper size boundary for the last size increment (inches or mesh).

Note: the values begin in columns 1, 11, 21,....., 71. Two or three data cards may be required, since there can be as many as 24 size boundaries.

Additional Notes: the size boundaries are actually read as characters and converted internally to numerical quantities. Fractional quantities must be written as fractions (not decimals), with a slash between the numerator and denominator. Mixed quantities (whole number and fraction) must have a dash (actually, a minus sign) separating the whole number from the fraction. Thus the quantity 1-5/8 would appear as

1-5/8

Blank spaces cannot appear within the number.

VI. WEIGHT DISTRIBUTION (Format: 13(1X, F5.3))

WT(1), WT(2),....., WT(NSIZE)

where WT(1) = the weight percent of the entire feed stream in the first size increment.

WT(2) = the weight percent of the entire feed stream in the second size increment.

.

.

.

WT(NSIZE) = the weight percent of the entire feed stream in the last size increment.

Note: The sum of these values should equal 100.

VII. SPECIFIC GRAVITY BOUNDARIES (Format: 13(1X, F5.3))

GBOUND(1), GBOUND(2),.....,GBOUND(NGRAV+1)

where GBOUND(1) = the lower specific gravity boundary for the first specific gravity increment.

GBOUND(2) = the upper specific gravity boundary for the first specific gravity increment.

GBOUND(3) = the upper specific gravity boundary for the second specific gravity increment.

.

.

.

GBOUND(NGRAV+1) = the upper specific gravity boundary for the last specific gravity increment.

VIII. BTU CONTENT (Format: 8(F7.5, 3X))

BTU1, BTU2, BTU3, BTU4

where the above parameters are used to calculate the BTU content of the coal (in BTU/lb) using the formula

$$\text{BTU/lb} = \text{Max} \begin{cases} \text{BTU2} - \text{BTU3}*\text{ASH} + \text{BTU4}*\text{ASH}**2 \\ \text{BTU1} \end{cases}$$

and ASH represents percent ash.

IX. SPECIFIC GRAVITY ANALYSIS OF FEED STREAM (Format: 8(F7.5, 3X))

FEED(I, J, 1), FEED(I, J, 2), FEED(I, J, 3), FEED(I, J, 4)

where FEED(I, J, 1) = the weight percent for the Ith size increment, Jth specific gravity increment. (Within each size increment, the sum of these values for all J should equal 100.)

FEED(I, J, 2) = the percent ash for the Ith size increment, Jth specific gravity increment.

FEED(I, J, 3) = the percent pyritic sulfur for the Ith size increment, Jth specific gravity increment.

FEED(I, J, 4) = the percent total sulfur for the Ith size increment, Jth specific gravity increment.

Notes:

1. The numerical values begin in columns 1, 11, 21, and 31. There will be a total of

   NSIZE x NGRAV

   cards (maximum number: 23 x 10 = 230).

2. When arranging these cards in the proper order, note that the J subscripts must increase more rapidly than the I subscripts. In other words, the specific gravity data are nested within the size data.

7.5 Sample Problem

The detailed solution of a sample problem involving a realistic plant configuration is presented below. A schematic flowchart of the plant configuration is shown on the next page. Note that the plant contains 3 washers, 2 crushers, 2 screens and a blender. The feed to the plant is crushed and separated into 3 size fractions -- coarse, intermediate and fine. Each size fraction is treated by a different type of washer, as indicated in the flowchart.

Notice that the units are numbered on the flowchart. The unit numbers increase in the direction of flow. The actual calculations are carried out in this order, so that the feed to a given unit is always known when the performance of that unit is simulated. This is <u>essential</u> for proper use of the simulator.

The flowstreams are also numbered, although the order of the flowstream numbers is immaterial. The flowstream numbers are each preceded by the letter "F", in order to avoid confusion with the unit numbers on the flowchart. (Note, however, that the F's are <u>not</u> a part of the actual flowstream numbers that are read into the computer.)

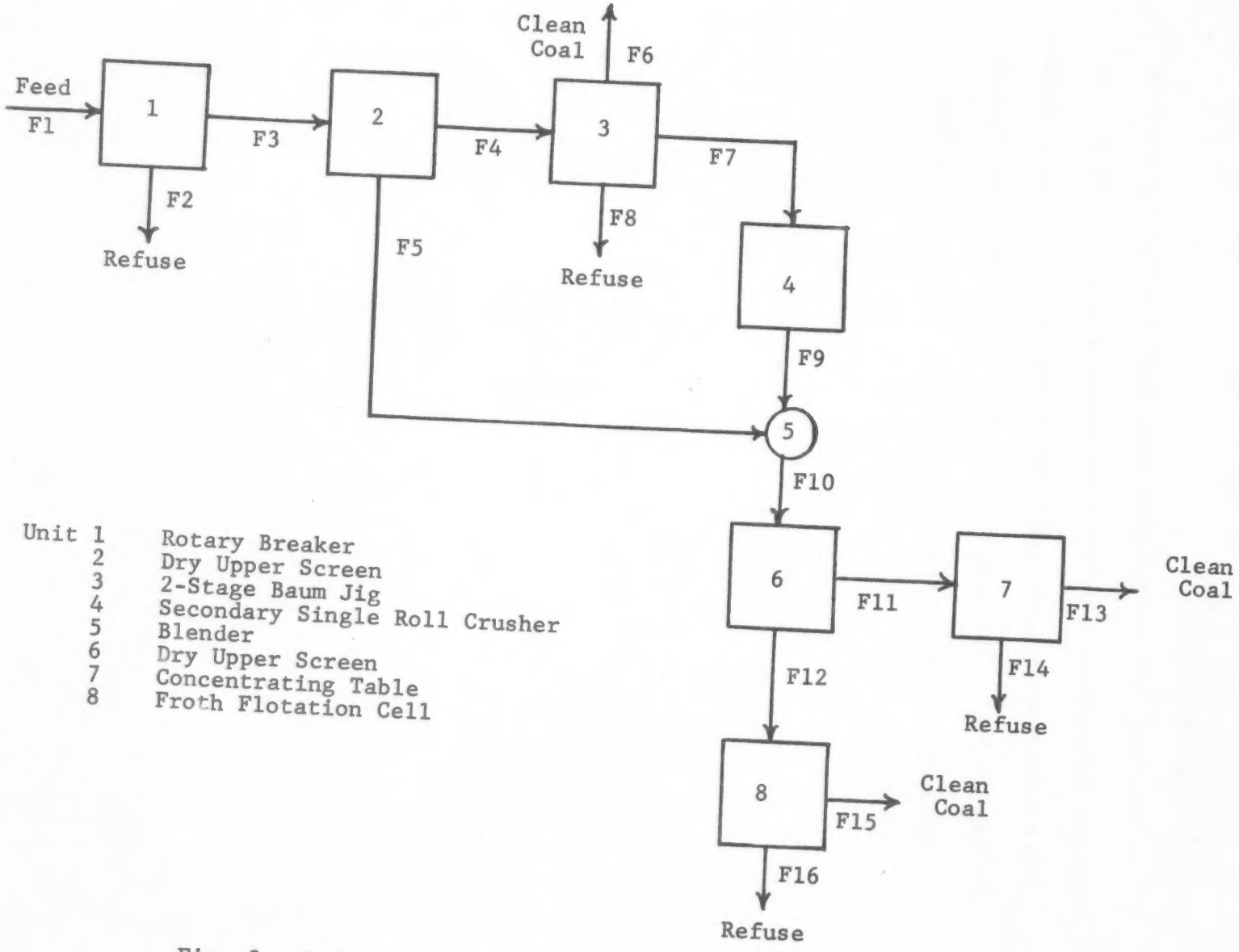

Fig. 8. Schematic flowchart for sample preparation plant

7.5.1 Data Preparation

The input data corresponding to the given flowchart are shown on the next several pages, as they would be placed on punched cards. The data set has been prepared in accordance with the instructions presented in Appendix 7.4. Note, in particular, the manner in which information is specified for each unit and each flowstream, and for the coal feed.

IBM

FORTRAN Coding Form

GX28-7327-6 U/M 050**
Printed in U.S.A.

PROGRAM: SAMPLE PROBLEM - INPUT DATA
PROGRAMMER: B. S. GOTTFRIED
DATE: 8/77
PUNCHING INSTRUCTIONS: GRAPHIC / PUNCH
PAGE 1 OF 4
CARD ELECTRO NUMBER*

COMM.	STATEMENT NUMBER	CONT.	FORTRAN STATEMENT	IDENTIFICATION SEQUENCE
			SAMPLE PLANT CONFIGURATION NUMBER 1 (ALPHEUS BAUM JIG DATA)	
	8 16		8 8 2 0 0 1	
	11		22.0 5.0 6.0	
	21		1.0	
	6		1.45	
	18		0.125	
	41			
	21		0.023	
	1		1.50	
	7			
	0		1	
	1		0 R	
	1		2 C	
	2		3 U	
	2		5 L	
	3		0 C	
	3		4 M	
	3		0 R	
	4		5	
	5		6	
	6		7 U	
	6		8 L	
	7		0 C	
	7		0 R	

*A standard card form, IBM electro 888157, is available for punching statements from this form

**Number of forms per pad may vary slightly

IBM

FORTRAN Coding Form

GX28-7327-6 U/M 050**
Printed in U.S.A.

PROGRAM | PROGRAMMER | DATE | PUNCHING INSTRUCTIONS | GRAPHIC | PUNCH | PAGE 2 OF 4 | CARD ELECTRO NUMBER*

COMM.	STATEMENT NUMBER	CONT.	FORTRAN STATEMENT	IDENTIFICATION SEQUENCE
	8	0	C	
	8	0	R	
	18		12 6 2 1 3/8 28 48	
	0			
			9.0 28.1 26.9 17.0 8.2 5.0 2.3 3.4	
			1.26 1.30 1.35 1.40 1.50 1.60 1.70 1.80 2.60	
	4000.		15100. 163.	
	19.7		2.8 .08 .58	
	11.0		4.4 .09 .55	
	2.3		7.8 .03 .46	
	11.3		15.4 .13 .51	
	2.1		25.0 .10 .35	
	1.9		31.5 .18 .44	
	0.8		41.0 .17 .45	
	51.1		84.6 .32 .32	
	16.7		2.9 .14 .55	
	14.3		4.7 .12 .45	
	5.3		9.4 .19 .55	
	5.3		16.7 .26 .68	
	4.1		26.7 .23 .54	
	2.1		35.1 .25 .55	
	1.2		45.7 .54 .70	
	50.9		82.9 .26 .27	
	23.3		2.4 .14 .58	

*A standard card form, IBM electro 888157, is available for punching statements from this form

**Number of forms per pad may vary slightly

IBM

FORTRAN Coding Form

GX28-7327-6 U/M 050**
Printed in U.S.A.

PROGRAM		PUNCHING INSTRUCTIONS	GRAPHIC								PAGE 3 OF 4
PROGRAMMER	DATE		PUNCH								CARD ELECTRO NUMBER*

C	STATEMENT NUMBER	CONT.	FORTRAN STATEMENT	IDENTIFICATION SEQUENCE
			21.0 4.7 .25 .62	
			7.3 9.7 .22 .63	
			7.9 16.2 .27 .62	
			4.7 25.9 .30 .63	
			2.4 34.2 .38 .73	
			1.7 42.5 .52 .73	
			31.7 82.2 .33 .35	
			26.8 2.4 .14 .60	
			21.0 4.7 .19 .70	
			8.0 9.6 .19 .77	
			7.4 15.9 .29 .62	
			3.9 24.8 .36 .65	
			2.3 33.0 .39 1.67	
			1.8 42.0 .66 1.84	
			28.9 82.9 .44 .45	
			31.6 2.2 .12 .59	
			21.9 4.6 .12 .60	
			7.2 9.2 .23 .63	
			6.8 15.4 .30 .64	
			3.2 23.8 .39 .63	
			1.9 32.7 .51 1.0	
			1.7 41.0 .78 1.07	
			25.8 82.2 .65 .65	
			40.8 2.2 .09 .59	

*A standard card form, IBM electro 880157, is available for punching statements from this form

**Number of forms per pad may vary slightly

IBM

FORTRAN Coding Form

GX28-7327-6 U/M 050**
Printed in U.S.A.

PROGRAM		PUNCHING INSTRUCTIONS	GRAPHIC									PAGE 4 OF 4
PROGRAMMER	DATE		PUNCH									CARD ELECTRO NUMBER*

COMM.	STATEMENT NUMBER	CONT	FORTRAN STATEMENT	IDENTIFICATION SEQUENCE
			4.6 .14 .60	
			9.2 .27 .63	
			15.4 .30 .61	
			23.8 .37 .67	
			32.7 .54 .80	
			41.0 .77 .97	
			82.2 .98 1.01	
			1.8 .12 .59	
			4.3 .18 .60	
			8.9 .23 .63	
			15.5 .31 .65	
			24.6 .43 .64	
			33.6 .54 .79	
			41.9 .77 .88	
			83.0 .98 .98	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	
			21.0 .33 .67	

*A standard card form, IBM electro 888157, is available for punching statements from this form

**Number of forms per pad may vary slightly

7.5.2 Computer Output

The output generated by the computer is shown on the following pages. The first four pages (pp. 190-193) contain the input data. (These pages are printed out in order to identify each problem.) The simulated plant performance is summarized at the end of the printout, on pp. 234-235. This information is of primary importance. In addition, the simulator provides an optional summary of each individual unit (pp. 194-203), and an optional detailed analysis of each flowstream (pp. 204-233). These optional tables will not be printed unless they are specifically requested (IOUT = 1 or IOUT = 2).

COAL PREPARATION PLANT SIMULATOR

SAMPLE PLANT CONFIGURATION NUMBER 1 (ALPHEUS BAUM JIG DATA)

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES
1	11 (ROTARY BREAKER)	22.000 5.000 6.000
2	21 (DRY UPPER SCREEN)	1.000
3	6 (2-STAGE BAUM JIG)	1.450
4	18 (SECONDARY SINGLE ROLL CRUSHER)	0.125
5	41 (STREAM BLENDER)	
6	21 (DRY UPPER SCREEN)	0.023
7	1 (CONCENTRATING TABLE)	1.500
8	7 (FROTH FLOTATION)	

FLOWSTREAM NUMBER	ORIGIN - UNIT NUMBER	DESTINATION - UNIT NUMBER
1 (FEED)	0	1
2 (REFUSE PRODUCT)	1 R	0
3	1 C	2
4	2 U	3
5	2 L	5
6 (CLEAN COAL PRODUCT)	3 C	0
7	3 M	4
8 (REFUSE PRODUCT)	3 R	0
9	4	5
10	5	6
11	6 U	7
12	6 L	8
13 (CLEAN COAL PRODUCT)	7 C	0

14	(REFUSE PRODUCT)	7	R	0
15	(CLEAN COAL PRODUCT)	8	C	0
16	(REFUSE PRODUCT)	8	R	0

NUNITS= 8 NFLOWS= 16 NSIZE= 8 NGRAV= 8 IOUT= 2 ICMAX= 50 NCOMP= 0

SPECIFIC GRAVITY ANALYSIS OF FEED

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
18 BY 12	9.0 PERCENT	FLOAT 1.30	19.7	2.8	0.08	0.58	14644.	19.7	2.8	0.08	0.58	14644.
		1.30-1.35	11.0	4.4	0.09	0.55	14383.	30.6	3.4	0.08	0.57	14550.
		1.35-1.40	2.3	7.8	0.03	0.46	13829.	32.9	3.7	0.08	0.56	14500.
		1.40-1.50	11.3	15.4	0.13	0.51	12590.	44.2	6.7	0.09	0.55	14013.
		1.50-1.60	2.1	25.0	0.10	0.35	11025.	46.3	7.5	0.09	0.54	13877.
		1.60-1.70	1.9	31.5	0.18	0.44	9966.	48.2	8.4	0.10	0.54	13724.
		1.70-1.80	0.8	41.0	0.17	0.45	8417.	49.0	9.0	0.10	0.53	13637.
		SINK 1.80	51.0	84.6	0.32	0.32	4000.	100.0	47.5	0.21	0.42	8722.
12 BY 6	28.1 PERCENT	FLOAT 1.30	16.7	2.9	0.14	0.55	14627.	16.7	2.9	0.14	0.55	14627.
		1.30-1.35	14.3	4.7	0.12	0.45	14334.	31.0	3.7	0.13	0.50	14492.
		1.35-1.40	5.3	9.4	0.19	0.55	13568.	36.3	4.6	0.14	0.51	14357.
		1.40-1.50	5.3	16.7	0.26	0.68	12378.	41.6	6.1	0.15	0.53	14105.
		1.50-1.60	4.1	26.7	0.23	0.54	10748.	45.7	8.0	0.16	0.53	13804.
		1.60-1.70	2.1	35.1	0.25	0.55	9379.	47.8	9.1	0.17	0.53	13609.
		1.70-1.80	1.2	45.7	0.54	0.70	7651.	49.0	10.0	0.17	0.54	13463.
		SINK 1.80	51.0	82.9	0.26	0.27	4000.	100.0	47.2	0.22	0.40	8642.
6 BY 2	26.9 PERCENT	FLOAT 1.30	23.3	2.4	0.14	0.58	14709.	23.3	2.4	0.14	0.58	14709.
		1.30-1.35	21.0	4.7	0.25	0.62	14334.	44.3	3.5	0.19	0.60	14531.
		1.35-1.40	7.3	9.7	0.22	0.63	13519.	51.6	4.4	0.20	0.60	14386.
		1.40-1.50	7.9	16.2	0.27	0.62	12459.	59.5	5.9	0.21	0.61	14132.
		1.50-1.60	4.7	25.9	0.30	0.63	10878.	64.2	7.4	0.21	0.61	13894.
		1.60-1.70	2.4	34.2	0.38	0.73	9525.	66.6	8.4	0.22	0.61	13736.
		1.70-1.80	1.7	42.5	0.52	0.73	8173.	68.3	9.2	0.23	0.61	13598.
		SINK 1.80	31.7	82.2	0.33	0.35	4000.	100.0	32.4	0.26	0.53	10555.
2 BY 1	17.0 PERCENT	FLOAT 1.30	26.8	2.4	0.14	0.60	14709.	26.8	2.4	0.14	0.60	14709.
		1.30-1.35	21.0	4.7	0.19	0.70	14334.	47.8	3.4	0.16	0.64	14544.
		1.35-1.40	8.0	9.6	0.19	0.77	13535.	55.7	4.3	0.17	0.66	14399.
		1.40-1.50	7.4	15.9	0.29	0.62	12508.	63.1	5.7	0.18	0.66	14178.
		1.50-1.60	3.9	24.8	0.36	0.65	11058.	67.0	6.8	0.19	0.66	13997.
		1.60-1.70	2.3	33.0	0.39	1.67	9721.	69.3	7.6	0.20	0.69	13855.
		1.70-1.80	1.8	42.0	0.66	1.84	8254.	71.1	8.5	0.21	0.72	13713.
		SINK 1.80	28.9	82.9	0.44	0.45	4000.	100.0	30.0	0.28	0.64	10909.
1 BY 3/8	8.2 PERCENT	FLOAT 1.30	31.6	2.2	0.12	0.59	14741.	31.6	2.2	0.12	0.59	14741.
		1.30-1.35	21.9	4.6	0.12	0.60	14350.	53.4	3.2	0.12	0.59	14581.
		1.35-1.40	7.2	9.2	0.23	0.63	13600.	60.6	3.9	0.13	0.60	14465.
		1.40-1.50	6.8	15.4	0.30	0.64	12590.	67.4	5.1	0.15	0.60	14276.
		1.50-1.60	3.2	23.8	0.39	0.63	11221.	70.6	5.9	0.16	0.60	14138.
		1.60-1.70	1.9	32.7	0.51	1.00	9770.	72.5	6.6	0.17	0.61	14023.
		1.70-1.80	1.7	41.0	0.78	1.07	8417.	74.2	7.4	0.18	0.62	13895.
		SINK 1.80	25.8	82.2	0.65	0.65	4000.	100.0	26.7	0.30	0.63	11345.
3/8 BY 28	5.0 PERCENT	FLOAT 1.30	40.8	2.2	0.09	0.59	14741.	40.8	2.2	0.09	0.59	14741.
		1.30-1.35	20.7	4.6	0.14	0.60	14350.	61.4	3.0	0.11	0.59	14610.
		1.35-1.40	6.8	9.2	0.27	0.63	13600.	68.2	3.6	0.12	0.60	14509.
		1.40-1.50	6.1	15.4	0.30	0.61	12590.	74.3	4.6	0.14	0.60	14352.
		1.50-1.60	2.9	23.8	0.37	0.67	11221.	77.2	5.3	0.15	0.60	14234.
		1.60-1.70	1.8	32.7	0.54	0.80	9770.	79.0	5.9	0.16	0.61	14133.
		1.70-1.80	1.5	41.0	0.77	0.97	8417.	80.5	6.6	0.17	0.61	14026.
		SINK 1.80	19.5	82.2	0.98	1.01	4000.	100.0	21.3	0.33	0.69	12073.

28 BY 48	2.3 PERCENT	FLOAT 1.30	45.5	1.8	0.12	0.59	14807.	45.5	1.8	0.12	0.59	14807.
		1.30-1.35	18.8	4.3	0.18	0.60	14399.	64.3	2.5	0.14	0.59	14687.
		1.35-1.40	5.8	8.9	0.23	0.63	13649.	70.1	3.1	0.15	0.60	14602.
		1.40-1.50	5.1	15.5	0.31	0.65	12574.	75.2	3.9	0.16	0.60	14464.
		1.50-1.60	2.5	24.6	0.43	0.64	11090.	77.7	4.6	0.17	0.60	14355.
		1.60-1.70	1.6	33.6	0.54	0.79	9623.	79.3	5.2	0.17	0.60	14260.
		1.70-1.80	1.2	41.9	0.77	0.88	8270.	80.5	5.7	0.18	0.61	14171.
		SINK 1.80	19.5	83.0	0.98	0.98	4000.	100.0	20.8	0.34	0.48	12187.
48 BY 0	3.4 PERCENT	FLOAT 1.30	50.0	21.0	0.33	0.67	11677.	50.0	21.0	0.33	0.67	11677.
		1.30-1.35	20.0	21.0	0.33	0.67	11677.	70.0	21.0	0.33	0.67	11677.
		1.35-1.40	5.0	21.0	0.33	0.67	11677.	75.0	21.0	0.33	0.67	11677.
		1.40-1.50	5.0	21.0	0.33	0.67	11677.	80.0	21.0	0.33	0.67	11677.
		1.50-1.60	2.0	21.0	0.33	0.67	11677.	82.0	21.0	0.33	0.67	11677.
		1.60-1.70	2.0	21.0	0.33	0.67	11677.	84.0	21.0	0.33	0.67	11677.
		1.70-1.80	1.0	21.0	0.33	0.67	11677.	85.0	21.0	0.33	0.67	11677.
		SINK 1.80	15.0	21.0	0.33	0.67	11677.	100.0	21.0	0.33	0.67	11677.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	24.7	3.7	0.14	0.59	14490.	24.7	3.7	0.14	0.59	14490.
		1.30-1.35	18.2	5.3	0.18	0.59	14241.	42.9	4.4	0.16	0.59	14384.
		1.35-1.40	6.3	9.8	0.21	0.64	13509.	49.1	5.1	0.17	0.60	14273.
		1.40-1.50	7.0	16.1	0.26	0.62	12469.	56.2	6.5	0.18	0.60	14047.
		1.50-1.60	3.8	25.6	0.29	0.59	10931.	60.0	7.7	0.18	0.60	13849.
		1.60-1.70	2.2	33.4	0.35	0.85	9653.	62.1	8.6	0.19	0.61	13704.
		1.70-1.80	1.4	42.3	0.58	0.99	8201.	63.6	9.3	0.20	0.62	13578.
		SINK 1.80	36.4	82.0	0.36	0.38	4108.	100.0	35.8	0.26	0.53	10129.

FLOWSTREAM SUMMARY

FLOWRATE = 100.0 PERCENT OF FEED ASH = 35.8 PERCENT PYRITIC SULFUR = .26 PERCENT TOTAL SULFUR = .53 PERCENT

BTU CONTENT = 10129. BTU/LB

SO2 CONTENT = 1.04 LBS SO2/MILLION BTU

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 1

ROTARY BREAKER

LENGTH = 22.00 FEET DIAMETER = 5.00 FEET SIZE OF OPENING = 6.00 INCHES

SIZE, INCHES OR MESH	18 BY 12	12 BY 6	6 BY 2	2 BY 1	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:									
FEED (COAL + ROCK)	9.0	28.1	26.9	17.0	8.2	5.0	2.3	3.4	100.0
OVERFLOW (REFUSE) STREAM	24.3	75.7	0.0	0.0	0.0	0.0	0.0	0.0	100.0
UNDERFLOW (PRODUCT) STREAM	0.0	0.0	38.3	27.6	13.8	9.9	5.4	4.9	100.0
ASH, PERCENT:									
FEED (COAL + ROCK)	47.5	47.2	32.4	30.0	26.7	21.3	20.8	21.0	35.8
OVERFLOW (REFUSE) STREAM	94.3	92.5	0.0	0.0	0.0	0.0	0.0	0.0	92.9
UNDERFLOW (PRODUCT) STREAM	0.0	0.0	28.7	24.7	22.0	16.8	15.1	16.7	24.3
PYRITIC SULFUR, PERCENT:									
FEED (COAL + ROCK)	0.21	0.22	0.26	0.28	0.30	0.33	0.34	0.33	0.26
OVERFLOW (REFUSE) STREAM	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03
UNDERFLOW (PRODUCT) STREAM	0.00	0.00	0.28	0.30	0.32	0.34	0.35	0.34	0.30
TOTAL SULFUR, PERCENT:									
FEED (COAL + ROCK)	0.42	0.40	0.53	0.64	0.63	0.69	0.68	0.67	0.53
OVERFLOW (REFUSE) STREAM	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06
UNDERFLOW (PRODUCT) STREAM	0.00	0.00	0.56	0.64	0.65	0.71	0.72	0.69	0.62
BTU PER POUND, MOISTURE FREE:									
FEED (COAL + ROCK)	8722.	8642.	10555.	10909.	11345.	12073.	12187.	11677.	10129.
OVERFLOW (REFUSE) STREAM	4512.	4663.	0.	0.	0.	0.	0.	0.	8627.
UNDERFLOW (PRODUCT) STREAM	0.	0.	10692.	11148.	11546.	12360.	12632.	12053.	11273.
COAL PRODUCT/COAL FEED ..... PERCENT	0.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	98.2
COAL IN OVERFLOW STREAM ..... DO	6.2	8.3	0.0	0.0	0.0	0.0	0.0	0.0	7.8
ROCK IN UNDERFLOW STREAM ..... DO	0.0	0.0	21.4	17.3	14.8	9.6	8.3	2.5	16.5

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 2

DRY UPPER SCREEN

SIZE OF OPENING = 1.00 INCHES

SIZE, INCHES OR MESH	6 BY 2	2 BY 1	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:							
FEED	38.3	27.6	13.8	9.9	5.4	4.9	100.0
OVERFLOW (COARSE) STREAM	57.1	41.1	1.7	0.0	0.0	0.0	100.0
UNDERFLOW (FINE) STREAM	0.0	0.0	38.5	30.2	16.4	15.0	100.0
ASH, PERCENT:							
FEED	28.7	24.7	22.0	16.8	15.1	18.7	24.3
OVERFLOW (COARSE) STREAM	28.7	24.7	22.0	16.8	15.1	18.7	26.9
UNDERFLOW (FINE) STREAM	0.0	0.0	22.0	16.8	15.1	18.7	18.8
PYRITIC SULFUR, PERCENT:							
FEED	0.28	0.30	0.32	0.34	0.35	0.34	0.30
OVERFLOW (COARSE) STREAM	0.28	0.30	0.32	0.34	0.35	0.34	0.29
UNDERFLOW (FINE) STREAM	0.00	0.00	0.32	0.34	0.35	0.34	0.33
TOTAL SULFUR, PERCENT:							
FEED	0.56	0.64	0.65	0.71	0.72	0.69	0.62
OVERFLOW (COARSE) STREAM	0.56	0.64	0.65	0.71	0.72	0.69	0.59
UNDERFLOW (FINE) STREAM	0.00	0.00	0.65	0.71	0.72	0.69	0.69
BTU PER POUND, MOISTURE FREE:							
FEED	10692.	11148.	11546.	12360.	12632.	12053.	11273.
OVERFLOW (COARSE) STREAM	10692.	11148.	11546.	12360.	12632.	12053.	10894.
UNDERFLOW (FINE) STREAM	0.	0.	11546.	12360.	12632.	12053.	12045.
WEIGHT RATIO, UNDERFLOW TO FEED.... PERCENT	0.0	0.0	91.8	99.8	100.0	100.0	32.9
BTU RATIO, UNDERFLOW TO FEED..... DO	0.0	0.0	91.8	99.8	100.0	100.0	35.2

KCOUNT= 3 SGXX=1.450 SGSP=1.517 SGRAV(NS)=1.450

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 3

2-STAGE BAUM JIG

SPECIFIC GRAVITY OF SEPARATION = 1.45

SIZE, INCHES OR MESH		6 BY 2	2 BY 1	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:								
FEED		57.1	41.1	1.7	0.0	0.0	0.0	100.0
CLEAN COAL		52.7	45.2	2.0	0.0	0.0	0.0	100.0
REFUSE		63.6	35.2	1.2	0.0	0.0	0.0	100.0
MIDDLINGS		62.5	36.2	1.3	0.0	0.0	0.0	100.0
ASH, PERCENT:								
FEED		28.7	24.7	22.0	16.8	15.1	18.7	26.9
CLEAN COAL		5.1	6.3	6.8	7.8	10.0	18.4	5.7
REFUSE		61.3	60.2	60.8	52.3	46.1	21.0	60.9
MIDDLINGS		45.0	50.2	50.8	44.6	51.2	20.7	46.9
PYRITIC SULFUR, PERCENT:								
FEED		0.28	0.30	0.32	0.34	0.35	0.34	0.29
CLEAN COAL		0.18	0.17	0.17	0.19	0.25	0.32	0.17
REFUSE		0.42	0.54	0.70	0.95	0.94	0.48	0.47
MIDDLINGS		0.36	0.48	0.60	0.80	1.09	0.52	0.40
TOTAL SULFUR, PERCENT:								
FEED		0.56	0.64	0.65	0.71	0.72	0.69	0.59
CLEAN COAL		0.58	0.62	0.60	0.62	0.66	0.67	0.60
REFUSE		0.52	0.68	0.79	1.07	1.11	0.81	0.58
MIDDLINGS		0.56	0.70	0.76	0.98	1.19	0.84	0.61
BTU PER POUND, MOISTURE FREE:								
FEED		10692.	11148.	11546.	12360.	12632.	12053.	10894.
CLEAN COAL		14275.	14077.	13993.	13832.	13469.	12096.	14179.
REFUSE		5779.	5527.	5280.	6570.	7580.	11677.	5685.
MIDDLINGS		8168.	7090.	6888.	7837.	6757.	11724.	7762.
ACTUAL RECOVERY	PERCENT	53.0	63.2	69.7	76.6	87.4	88.7	57.4
THEORETICAL RECOVERY	DO	56.4	66.8	73.7	83.1	90.5	89.1	61.4
RECOVERY EFFICIENCY	DO	93.9	94.6	94.5	92.2	96.6	99.5	93.5
BTU RECOVERY	DO	70.7	79.8	84.4	85.7	93.2	89.1	74.8
ASH ERROR	DO	0.5	0.8	1.1	2.1	1.6	0.0	0.7
FLOAT IN REFUSE	PERCENT OF PRODUCT	5.7	7.0	7.5	15.7	56.3	55.6	10.2
SINK IN CLEAN COAL	DO	4.9	4.0	3.9	4.4	4.5	4.1	0.8
TOTAL MISPLACED MATERIAL	PERCENT OF FEED	4.3	4.1	4.1	4.2	4.6	4.2	3.7
NEAR GRAVITY 0.1 MATERIAL	DO	25.8	13.9	9.8	5.9	3.7	3.4	12.4
SPECIFIC GRAVITY OF SEPARATION		1.43	1.49	1.54	1.63	2.01	2.01	1.52
PROBABLE ERROR, SPECIFIC GRAVITY		.054	.084	.102	.227	.325	.325	.063
IMPERFECTION		.127	.171	.187	.363	.320	.320	.140
ERROR AREA		29.	53.	76.	140.	195.	195.	50.

DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):							
FLOAT 1.30	100.0	99.7	99.4	97.4	98.9	98.9	99.8
1.30-1.35	94.3	98.1	98.3	95.3	98.0	98.0	95.9
1.35-1.40	78.4	93.1	95.0	90.3	96.7	96.7	85.1
1.40-1.50	39.3	64.0	76.1	79.1	93.2	93.2	50.0
1.50-1.60	3.8	32.0	48.5	61.9	86.6	86.6	15.7
1.60-1.70	1.3	14.7	26.0	46.5	78.5	78.5	7.3
1.70-1.80	0.1	4.0	11.4	33.8	69.7	69.7	2.0
SINK 1.80	0.0	1.0	3.3	11.6	36.2	36.2	0.4

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 4

SECONDARY SINGLE ROLL CRUSHER

CRUSHER SETTING = .13 INCHES

SIZE, INCHES OR MESH	6 BY 2	2 BY 1	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:							
FEED	62.5	36.2	1.3	0.0	0.0	0.0	100.0
CRUSHED COAL	0.0	0.0	0.0	5.9	84.1	10.0	100.0
ASH, PERCENT:							
FEED	45.0	50.2	50.8	44.6	51.2	20.7	46.9
CRUSHED COAL	0.0	0.0	0.0	47.0	46.9	46.9	46.9
PYRITIC SULFUR, PERCENT:							
FEED	0.36	0.48	0.60	0.80	1.09	0.52	0.40
CRUSHED COAL	0.00	0.00	0.00	0.40	0.40	0.40	0.40
TOTAL SULFUR, PERCENT:							
FEED	0.56	0.70	0.76	0.98	1.19	0.84	0.61
CRUSHED COAL	0.00	0.00	0.00	0.61	0.61	0.61	0.61
BTU PER POUND, MOISTURE FREE:							
FEED	8168.	7090.	6888.	7837.	6757.	11724.	7762.
CRUSHED COAL	0.	0.	0.	7759.	7762.	7760.	7762.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 5

STREAM BLENDER

SIZE, INCHES OR MESH	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:					
FEED 1	38.5	30.2	16.4	15.0	100.0
FEED 2	0.0	5.9	84.1	10.0	100.0
PRODUCT	29.0	24.2	33.1	13.7	100.0
ASH, PERCENT:					
FEED 1	22.0	16.8	15.1	18.7	18.8
FEED 2	0.0	47.0	46.9	46.9	46.9
PRODUCT	22.0	18.6	35.1	23.8	25.8
PYRITIC SULFUR, PERCENT:					
FEED 1	0.32	0.34	0.35	0.34	0.33
FEED 2	0.00	0.40	0.40	0.40	0.40
PRODUCT	0.32	0.34	0.38	0.35	0.35
TOTAL SULFUR, PERCENT:					
FEED 1	0.65	0.71	0.72	0.69	0.69
FEED 2	0.00	0.61	0.61	0.61	0.61
PRODUCT	0.65	0.70	0.65	0.68	0.67
BTU PER POUND, MOISTURE FREE:					
FEED 1	11546.	12360.	12632.	12053.	12045.
FEED 2	15100.	7759.	7762.	7760.	7762.
PRODUCT	11546.	12066.	9511.	11225.	10954.

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 6

DRY UPPER SCREEN

SIZE OF OPENING = .02 INCHES

SIZE, INCHES OR MESH	1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:					
FEED	29.0	24.2	33.1	13.7	100.0
OVERFLOW (COARSE) STREAM	32.5	27.1	31.3	9.1	100.0
UNDERFLOW (FINE) STREAM	0.0	0.0	48.0	52.0	100.0
ASH, PERCENT:					
FEED	22.0	18.6	35.1	23.8	25.8
OVERFLOW (COARSE) STREAM	22.0	18.6	35.1	23.8	25.3
UNDERFLOW (FINE) STREAM	0.0	0.0	35.1	23.8	29.2
PYRITIC SULFUR, PERCENT:					
FEED	0.32	0.34	0.38	0.35	0.35
OVERFLOW (COARSE) STREAM	0.32	0.34	0.38	0.35	0.35
UNDERFLOW (FINE) STREAM	0.00	0.00	0.38	0.35	0.37
TOTAL SULFUR, PERCENT:					
FEED	0.65	0.70	0.65	0.68	0.67
OVERFLOW (COARSE) STREAM	0.65	0.70	0.65	0.68	0.67
UNDERFLOW (FINE) STREAM	0.00	0.00	0.65	0.68	0.66
BTU PER POUND, MOISTURE FREE:					
FEED	11546.	12066.	9511.	11225.	10954.
OVERFLOW (COARSE) STREAM	11546.	12066.	9511.	11225.	11021.
UNDERFLOW (FINE) STREAM	0.	0.	9511.	11225.	10402.
WEIGHT RATIO, UNDERFLOW TO FEED.... PERCENT	0.0	0.0	15.6	40.6	10.7
BTU RATIO, UNDERFLOW TO FEED..... DO	0.0	0.0	15.6	40.6	10.2

KCOUNT= 2 SGXX=1.500 SGSP=1.486 SGRAV(NS)=1.499

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 7

CONCENTRATING TABLE

SPECIFIC GRAVITY OF SEPARATION = 1.50

SIZE, INCHES OR MESH		1 BY 3/8	3/8 BY 28	28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:						
FEED		32.5	27.1	31.3	9.1	100.0
CLEAN COAL		34.9	30.2	23.2	11.7	100.0
REFUSE		28.9	22.3	43.6	5.2	100.0
ASH, PERCENT:						
FEED		22.0	18.6	35.1	23.8	25.3
CLEAN COAL		5.1	5.2	11.9	19.6	8.4
REFUSE		52.7	46.1	53.7	38.1	50.9
PYRITIC SULFUR, PERCENT:						
FEED		0.32	0.34	0.38	0.35	0.35
CLEAN COAL		0.15	0.15	0.21	0.31	0.18
REFUSE		0.62	0.74	0.53	0.50	0.60
TOTAL SULFUR, PERCENT:						
FEED		0.65	0.70	0.65	0.68	0.67
CLEAN COAL		0.59	0.60	0.62	0.66	0.61
REFUSE		0.76	0.92	0.68	0.73	0.76
BTU PER POUND, MOISTURE FREE:						
FEED		11546.	12066.	9511.	11225.	11021.
CLEAN COAL		14263.	14256.	13167.	11913.	13731.
REFUSE		6584.	7593.	6578.	8884.	6927.
ACTUAL RECOVERY	PERCENT	64.6	67.1	44.5	77.3	60.2
THEORETICAL RECOVERY	DO	67.4	70.9	56.5	82.9	66.8
RECOVERY EFFICIENCY	DO	95.8	94.6	78.8	93.3	90.0
BTU RECOVERY	DO	79.8	79.3	61.6	82.0	75.0
ASH ERROR	DO	0.4	0.6	4.1	1.2	1.5
FLOAT IN REFUSE	PERCENT OF PRODUCT	11.3	14.4	16.7	23.6	13.6
SINK IN CLEAN COAL	DO	3.5	4.0	14.7	4.9	15.4
TOTAL MISPLACED MATERIAL	PERCENT OF FEED	6.3	7.4	15.8	9.1	10.2
NEAR GRAVITY 0.1 MATERIAL	DO	15.9	16.5	21.3	4.6	17.1
SPECIFIC GRAVITY OF SEPARATION		1.47	1.47	1.53	1.73	1.49
PROBABLE ERROR, SPECIFIC GRAVITY		.061	.065	.134	.244	.104
IMPERFECTION		.130	.139	.253	.332	.208
ERROR AREA		36.	41.	93.	152.	76.

DISTRIBUTION, PERCENT TO WASHED COAL (SPECIFIC GRAVITY FRACTION):					
FLOAT 1.30	99.4	98.9	93.5	96.9	97.9
1.30-1.35	97.6	95.8	89.0	95.6	95.3
1.35-1.40	88.3	87.7	81.0	93.8	86.6
1.40-1.50	57.6	57.2	66.4	90.1	63.5
1.50-1.60	16.2	20.1	45.6	80.3	36.3
1.60-1.70	1.9	4.8	27.9	65.1	20.2
1.70-1.80	1.8	2.3	15.4	47.3	11.2
SINK 1.80	0.0	0.2	3.1	16.2	2.6

SUMMARY OF THE PERFORMANCE CHARACTERISTICS OF UNIT NUMBER 8

FROTH FLOTATION

SIZE, INCHES OR MESH		28 BY 48	48 BY 0	COMP
SCREEN ANALYSIS, PERCENT:				
FEED		48.0	52.0	100.0
CLEAN COAL		35.8	64.2	100.0
REFUSE		64.1	35.9	100.0
ASH, PERCENT:				
FEED		35.1	23.8	29.2
CLEAN COAL		11.5	18.2	15.8
REFUSE		52.4	37.0	46.9
PYRITIC SULFUR, PERCENT:				
FEED		0.38	0.35	0.37
CLEAN COAL		0.21	0.30	0.27
REFUSE		0.51	0.48	0.50
TOTAL SULFUR, PERCENT:				
FEED		0.65	0.68	0.66
CLEAN COAL		0.61	0.66	0.64
REFUSE		0.68	0.72	0.70
BTU PER POUND, MOISTURE FREE:				
FEED		9511.	11225.	10402.
CLEAN COAL		13229.	12141.	12531.
REFUSE		6779.	9073.	7603.
ACTUAL RECOVERY	PERCENT	42.4	70.1	56.8
BTU RECOVERY	DO	58.9	75.9	68.4

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 1

ORIGIN = UNIT NUMBER 0 DESTINATION = UNIT NUMBER 1

SIZE FRACTION AND WEIGHT	SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
18 BY 12											
9.0 PERCENT	FLOAT 1.30	19.7	2.8	0.08	0.58	14644.	19.7	2.8	0.08	0.58	14644.
	1.30-1.35	11.0	4.4	0.09	0.55	14383.	30.6	3.4	0.08	0.57	14550.
	1.35-1.40	2.3	7.8	0.03	0.46	13829.	32.9	3.7	0.08	0.56	14500.
	1.40-1.50	11.3	15.4	0.13	0.51	12590.	44.2	6.7	0.09	0.55	14013.
	1.50-1.60	2.1	25.0	0.10	0.35	11025.	46.3	7.5	0.09	0.54	13877.
	1.60-1.70	1.9	31.5	0.18	0.44	9966.	48.2	8.4	0.10	0.54	13724.
	1.70-1.80	0.8	41.0	0.17	0.45	8417.	49.0	9.0	0.10	0.53	13637.
	SINK 1.80	51.0	84.6	0.32	0.32	4000.	100.0	47.5	0.21	0.42	8722.
12 BY 6											
28.1 PERCENT	FLOAT 1.30	16.7	2.9	0.14	0.55	14627.	16.7	2.9	0.14	0.55	14627.
	1.30-1.35	14.3	4.7	0.12	0.45	14334.	31.0	3.7	0.13	0.50	14492.
	1.35-1.40	5.3	9.4	0.19	0.55	13568.	36.3	4.6	0.14	0.51	14357.
	1.40-1.50	5.3	16.7	0.26	0.68	12378.	41.6	6.1	0.15	0.53	14105.
	1.50-1.60	4.1	26.7	0.23	0.54	10748.	45.7	8.0	0.16	0.53	13804.
	1.60-1.70	2.1	35.1	0.25	0.55	9379.	47.8	9.1	0.17	0.53	13609.
	1.70-1.80	1.2	45.7	0.54	0.70	7651.	49.0	10.0	0.17	0.54	13463.
	SINK 1.80	51.0	82.9	0.26	0.27	4000.	100.0	47.2	0.22	0.40	8642.
6 BY 2											
26.9 PERCENT	FLOAT 1.30	23.3	2.4	0.14	0.58	14709.	23.3	2.4	0.14	0.58	14709.
	1.30-1.35	21.0	4.7	0.25	0.62	14334.	44.3	3.5	0.19	0.60	14531.
	1.35-1.40	7.3	9.7	0.22	0.63	13519.	51.6	4.4	0.20	0.60	14388.
	1.40-1.50	7.9	16.2	0.27	0.62	12459.	59.5	5.9	0.21	0.61	14132.
	1.50-1.60	4.7	25.9	0.30	0.63	10878.	64.2	7.4	0.21	0.61	13894.
	1.60-1.70	2.4	34.2	0.38	0.73	9525.	66.6	8.4	0.22	0.61	13736.
	1.70-1.80	1.7	42.5	0.52	0.73	8173.	68.3	9.2	0.23	0.61	13598.
	SINK 1.80	31.7	82.2	0.33	0.35	4000.	100.0	32.4	0.26	0.53	10555.
2 BY 1											
17.0 PERCENT	FLOAT 1.30	26.8	2.4	0.14	0.60	14709.	26.8	2.4	0.14	0.60	14709.
	1.30-1.35	21.0	4.7	0.19	0.70	14334.	47.8	3.4	0.16	0.64	14544.
	1.35-1.40	8.0	9.6	0.19	0.77	13535.	55.7	4.3	0.17	0.66	14399.
	1.40-1.50	7.4	15.9	0.29	0.62	12508.	63.1	5.7	0.18	0.66	14178.
	1.50-1.60	3.9	24.8	0.36	0.65	11058.	67.0	6.8	0.19	0.66	13997.
	1.60-1.70	2.3	33.0	0.39	1.67	9721.	69.3	7.6	0.20	0.69	13855.
	1.70-1.80	1.8	42.0	0.66	1.84	8254.	71.1	8.5	0.21	0.72	13713.
	SINK 1.80	28.9	82.9	0.44	0.45	4000.	100.0	30.0	0.28	0.64	10909.
1 BY 3/8											
8.2 PERCENT	FLOAT 1.30	31.6	2.2	0.12	0.59	14741.	31.6	2.2	0.12	0.59	14741.
	1.30-1.35	21.9	4.6	0.12	0.60	14350.	53.4	3.2	0.12	0.59	14581.
	1.35-1.40	7.2	9.2	0.23	0.63	13600.	60.6	3.9	0.13	0.60	14465.
	1.40-1.50	6.8	15.4	0.30	0.64	12590.	67.4	5.1	0.15	0.60	14276.
	1.50-1.60	3.2	23.8	0.39	0.63	11221.	70.6	5.9	0.16	0.60	14138.
	1.60-1.70	1.9	32.7	0.51	1.00	9770.	72.5	6.6	0.17	0.61	14023.
	1.70-1.80	1.7	41.0	0.78	1.07	8417.	74.2	7.4	0.18	0.62	13895.
	SINK 1.80	25.8	82.2	0.65	0.65	4000.	100.0	26.7	0.30	0.63	11345.
3/8 BY 28											
5.0 PERCENT	FLOAT 1.30	40.8	2.2	0.09	0.59	14741.	40.8	2.2	0.09	0.59	14741.
	1.30-1.35	20.7	4.6	0.14	0.60	14350.	61.4	3.0	0.11	0.59	14610.
	1.35-1.40	6.8	9.2	0.27	0.63	13600.	68.2	3.6	0.12	0.60	14509.
	1.40-1.50	6.1	15.4	0.30	0.61	12590.	74.3	4.6	0.14	0.60	14352.
	1.50-1.60	2.9	23.8	0.37	0.67	11221.	77.2	5.3	0.15	0.60	14234.

		1.60-1.70	1.8	32.7	0.54	0.80	9770.	79.0	5.9	0.16	0.61	14133.
		1.70-1.80	1.5	41.0	0.77	0.97	8417.	80.5	6.6	0.17	0.61	14026.
		SINK 1.80	19.5	82.2	0.98	1.01	4000.	100.0	21.3	0.33	0.69	12073.
28 BY 48	2.3 PERCENT	FLOAT 1.30	45.5	1.8	0.12	0.59	14807.	45.5	1.8	0.12	0.59	14807.
		1.30-1.35	18.8	4.3	0.18	0.60	14399.	64.3	2.5	0.14	0.59	14687.
		1.35-1.40	5.8	8.9	0.23	0.63	13649.	70.1	3.1	0.15	0.60	14602.
		1.40-1.50	5.1	15.5	0.31	0.65	12574.	75.2	3.9	0.16	0.60	14464.
		1.50-1.60	2.5	24.6	0.43	0.64	11090.	77.7	4.6	0.17	0.60	14355.
		1.60-1.70	1.6	33.6	0.54	0.79	9623.	79.3	5.2	0.17	0.60	14260.
		1.70-1.80	1.2	41.9	0.77	0.88	8270.	80.5	5.7	0.18	0.61	14171.
		SINK 1.80	19.5	83.0	0.98	0.98	4000.	100.0	20.8	0.34	0.68	12187.
48 BY 0	3.4 PERCENT	FLOAT 1.30	50.0	21.0	0.33	0.67	11677.	50.0	21.0	0.33	0.67	11677.
		1.30-1.35	20.0	21.0	0.33	0.67	11677.	70.0	21.0	0.33	0.67	11677.
		1.35-1.40	5.0	21.0	0.33	0.67	11677.	75.0	21.0	0.33	0.67	11677.
		1.40-1.50	5.0	21.0	0.33	0.67	11677.	80.0	21.0	0.33	0.67	11677.
		1.50-1.60	2.0	21.0	0.33	0.67	11677.	82.0	21.0	0.33	0.67	11677.
		1.60-1.70	2.0	21.0	0.33	0.67	11677.	84.0	21.0	0.33	0.67	11677.
		1.70-1.80	1.0	21.0	0.33	0.67	11677.	85.0	21.0	0.33	0.67	11677.
		SINK 1.80	15.0	21.0	0.33	0.67	11677.	100.0	21.0	0.33	0.67	11677.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	24.7	3.7	0.14	0.59	14490.	24.7	3.7	0.14	0.59	14490.
		1.30-1.35	18.2	5.3	0.18	0.59	14241.	42.9	4.4	0.16	0.59	14384.
		1.35-1.40	6.3	9.8	0.21	0.64	13509.	49.1	5.1	0.17	0.60	14273.
		1.40-1.50	7.0	16.1	0.26	0.62	12469.	56.2	6.5	0.18	0.60	14047.
		1.50-1.60	3.8	25.6	0.29	0.59	10931.	60.0	7.7	0.18	0.60	13849.
		1.60-1.70	2.2	33.4	0.35	0.85	9653.	62.1	8.6	0.19	0.61	13704.
		1.70-1.80	1.4	42.3	0.58	0.99	8201.	63.6	9.3	0.20	0.62	13578.
		SINK 1.80	36.4	82.0	0.36	0.38	4108.	100.0	35.8	0.26	0.53	10129.

FLOWSTREAM SUMMARY

FLOWRATE = 100.0 PERCENT OF FEED ASH = 35.8 PERCENT PYRITIC SULFUR = .26 PERCENT TOTAL SULFUR = .53 PERCENT

BTU CONTENT = 10129. BTU/LB

SO2 CONTENT = 1.04 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 2

ORIGIN = UNIT NUMBER 1 R DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
18 BY 12	24.3 PERCENT	FLOAT 1.30	2.1	2.8	0.08	0.58	14644.	2.1	2.8	0.08	0.58	14644.
		1.30-1.35	1.2	4.4	0.09	0.55	14383.	3.3	3.4	0.08	0.57	14550.
		1.35-1.40	0.2	7.8	0.03	0.46	13829.	3.6	3.7	0.08	0.56	14500.
		1.40-1.50	1.2	15.4	0.13	0.51	12590.	4.8	6.7	0.09	0.55	14013.
		1.50-1.60	0.2	25.0	0.10	0.35	11025.	5.0	7.5	0.09	0.54	13877.
		1.60-1.70	0.2	31.5	0.18	0.44	9966.	5.2	8.4	0.10	0.54	13724.
		1.70-1.80	0.1	41.0	0.17	0.45	8417.	5.3	9.0	0.10	0.53	13637.
		SINK 1.80	94.7	99.1	0.02	0.02	4000.	100.0	94.3	0.02	0.05	4512.
12 BY 6	75.7 PERCENT	FLOAT 1.30	2.5	2.9	0.12	0.56	14632.	2.5	2.9	0.12	0.56	14632.
		1.30-1.35	1.9	4.6	0.11	0.47	14343.	4.4	3.6	0.12	0.52	14506.
		1.35-1.40	0.7	9.2	0.17	0.54	13598.	5.1	4.4	0.13	0.52	14388.
		1.40-1.50	1.0	16.2	0.21	0.61	12462.	6.0	6.2	0.14	0.54	14082.
		1.50-1.60	0.5	26.5	0.21	0.51	10786.	6.5	7.8	0.15	0.53	13821.
		1.60-1.70	0.3	34.3	0.23	0.53	9506.	6.8	9.0	0.15	0.53	13636.
		1.70-1.80	0.2	44.9	0.48	0.66	7781.	7.0	9.8	0.16	0.54	13504.
		SINK 1.80	93.0	98.7	0.02	0.02	4000.	100.0	92.5	0.03	0.06	4663.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	2.4	2.9	0.11	0.56	14634.	2.4	2.9	0.11	0.56	14634.
		1.30-1.35	1.7	4.6	0.11	0.48	14350.	4.1	3.6	0.11	0.53	14514.
		1.35-1.40	0.6	9.0	0.16	0.53	13625.	4.7	4.2	0.12	0.53	14409.
		1.40-1.50	1.0	15.9	0.19	0.58	12501.	5.7	6.3	0.13	0.54	14068.
		1.50-1.60	0.4	26.3	0.20	0.49	10821.	6.2	7.8	0.13	0.54	13833.
		1.60-1.70	0.3	33.7	0.22	0.51	9603.	6.4	8.9	0.14	0.53	13654.
		1.70-1.80	0.1	44.1	0.43	0.62	7907.	6.6	9.6	0.14	0.54	13531.
		SINK 1.80	93.4	98.8	0.02	0.02	4000.	100.0	92.9	0.03	0.06	4627.

FLOWSTREAM SUMMARY

FLOWRATE = 16.8 PERCENT OF FEED ASH = 92.9 PERCENT PYRITIC SULFUR = .03 PERCENT TOTAL SULFUR = .06 PERCENT

BTU CONTENT = 4627. BTU/LB

SO2 CONTENT = 0.24 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 3

ORIGIN = UNIT NUMBER 1 C DESTINATION = UNIT NUMBER 2

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	38.3 PERCENT	FLOAT 1.30	24.2	2.6	0.13	0.57	14682.	24.2	2.6	0.13	0.57	14682.
		1.30-1.35	20.7	4.7	0.21	0.57	14337.	44.9	3.5	0.17	0.57	14523.
		1.35-1.40	7.1	9.5	0.20	0.60	13544.	52.1	4.4	0.17	0.58	14389.
		1.40-1.50	8.6	16.2	0.25	0.62	12462.	60.7	6.0	0.18	0.58	14115.
		1.50-1.60	4.9	26.1	0.27	0.59	10846.	65.6	7.5	0.19	0.58	13869.
		1.60-1.70	2.6	34.2	0.32	0.65	9521.	68.3	8.6	0.19	0.59	13703.
		1.70-1.80	1.7	43.2	0.51	0.71	8051.	69.9	9.4	0.20	0.59	13567.
		SINK 1.80	30.1	73.6	0.46	0.48	4000.	100.0	28.7	0.28	0.56	10692.
2 BY 1	27.6 PERCENT	FLOAT 1.30	27.1	2.5	0.14	0.58	14685.	27.1	2.5	0.14	0.58	14685.
		1.30-1.35	21.6	4.7	0.17	0.62	14337.	48.7	3.5	0.15	0.60	14531.
		1.35-1.40	7.9	9.5	0.19	0.69	13551.	56.5	4.3	0.16	0.61	14394.
		1.40-1.50	8.6	16.0	0.26	0.62	12484.	65.1	5.9	0.17	0.61	14143.
		1.50-1.60	4.7	25.6	0.30	0.60	10931.	69.7	7.2	0.18	0.61	13929.
		1.60-1.70	2.6	33.6	0.33	1.14	9616.	72.4	8.2	0.18	0.63	13771.
		1.70-1.80	1.8	42.9	0.59	1.36	8101.	74.2	9.0	0.19	0.65	13633.
		SINK 1.80	25.8	70.0	0.60	0.62	4000.	100.0	24.7	0.30	0.64	11148.
1 BY 3/8	13.8 PERCENT	FLOAT 1.30	30.5	2.4	0.13	0.58	14712.	30.5	2.4	0.13	0.58	14712.
		1.30-1.35	22.6	4.6	0.14	0.58	14345.	53.1	3.3	0.13	0.58	14556.
		1.35-1.40	7.7	9.3	0.21	0.63	13582.	60.8	4.1	0.14	0.59	14433.
		1.40-1.50	8.2	15.8	0.27	0.63	12526.	68.9	5.5	0.16	0.59	14207.
		1.50-1.60	4.2	25.1	0.32	0.60	11016.	73.2	6.6	0.17	0.59	14023.
		1.60-1.70	2.4	33.4	0.39	0.90	9650.	75.6	7.5	0.17	0.60	13883.
		1.70-1.80	1.8	42.2	0.67	1.04	8222.	77.4	8.3	0.18	0.61	13751.
		SINK 1.80	22.6	68.8	0.78	0.79	4000.	100.0	22.0	0.32	0.65	11546.
3/8 BY 28	9.9 PERCENT	FLOAT 1.30	36.2	2.3	0.11	0.59	14718.	36.2	2.3	0.11	0.59	14718.
		1.30-1.35	22.9	4.6	0.15	0.59	14345.	59.0	3.2	0.12	0.59	14573.
		1.35-1.40	7.8	9.3	0.23	0.63	13580.	66.8	3.9	0.14	0.59	14457.
		1.40-1.50	8.0	15.8	0.27	0.62	12527.	74.8	5.2	0.15	0.60	14250.
		1.50-1.60	4.2	25.0	0.32	0.61	11024.	79.0	6.3	0.16	0.60	14081.
		1.60-1.70	2.4	33.4	0.41	0.86	9657.	81.4	7.1	0.17	0.60	13949.
		1.70-1.80	1.8	42.2	0.67	1.03	8229.	83.2	7.8	0.18	0.61	13827.
		SINK 1.80	16.8	61.4	1.14	1.17	5099.	100.0	16.8	0.34	0.71	12360.
28 BY 48	5.4 PERCENT	FLOAT 1.30	40.3	2.1	0.12	0.59	14756.	40.3	2.1	0.12	0.59	14756.
		1.30-1.35	22.4	4.5	0.16	0.60	14363.	62.7	3.0	0.13	0.59	14616.
		1.35-1.40	7.4	9.2	0.22	0.64	13599.	70.1	3.6	0.14	0.59	14508.
		1.40-1.50	7.4	15.7	0.28	0.63	12534.	77.5	4.8	0.16	0.60	14320.
		1.50-1.60	3.8	25.0	0.34	0.62	11026.	81.3	5.7	0.16	0.60	14167.
		1.60-1.70	2.2	33.5	0.44	0.87	9638.	83.5	6.5	0.17	0.61	14045.
		1.70-1.80	1.7	42.2	0.69	1.01	8224.	85.2	7.2	0.18	0.61	13932.
		SINK 1.80	14.8	61.0	1.32	1.34	5163.	100.0	15.1	0.35	0.72	12652.
48 BY 0	4.9 PERCENT	FLOAT 1.30	49.5	17.9	0.30	0.66	12179.	49.5	17.9	0.30	0.66	12179.
		1.30-1.35	20.6	17.8	0.30	0.66	12201.	70.1	17.9	0.30	0.66	12185.
		1.35-1.40	5.5	18.2	0.31	0.66	12139.	75.6	17.9	0.30	0.66	12182.
		1.40-1.50	5.4	19.8	0.32	0.66	11878.	81.0	18.0	0.30	0.66	12162.
		1.50-1.60	2.3	22.1	0.34	0.66	11506.	83.3	18.1	0.30	0.66	12144.

		1.60-1.70	2.0	23.3	0.36	0.70	11297.	85.3	18.3	0.30	0.66	12123.
		1.70-1.80	1.1	26.4	0.43	0.75	10804.	86.4	18.4	0.30	0.66	12106.
		SINK 1.80	13.6	20.8	0.58	0.89	11715.	100.0	18.7	0.34	0.69	12053.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	29.2	3.8	0.14	0.59	14487.	29.2	3.8	0.14	0.59	14487.
		1.30-1.35	21.5	5.3	0.18	0.59	14239.	50.7	4.4	0.16	0.59	14382.
		1.35-1.40	7.4	9.8	0.21	0.64	13507.	58.1	5.1	0.17	0.60	14271.
		1.40-1.50	8.3	16.1	0.26	0.62	12468.	66.4	6.5	0.18	0.60	14046.
		1.50-1.60	4.5	25.6	0.29	0.60	10934.	70.9	7.7	0.18	0.60	13849.
		1.60-1.70	2.5	33.4	0.35	0.86	9655.	73.4	8.6	0.19	0.61	13705.
		1.70-1.80	1.7	42.3	0.58	1.00	8207.	75.1	9.3	0.20	0.62	13579.
		SINK 1.80	24.9	69.3	0.62	0.64	4318.	100.0	24.3	0.30	0.62	11273.

FLOWSTREAM SUMMARY

FLOWRATE = 83.2 PERCENT OF FEED ASH = 24.3 PERCENT PYRITIC SULFUR = .30 PERCENT TOTAL SULFUR = .62 PERCENT

BTU CONTENT = 11273. BTU/LB

SO2 CONTENT = 1.11 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 4

ORIGIN = UNIT NUMBER 2 U DESTINATION = UNIT NUMBER 3

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	57.1 PERCENT	FLOAT 1.30	24.2	2.6	0.13	0.57	14682.	24.2	2.6	0.13	0.57	14682.
		1.30-1.35	20.7	4.7	0.21	0.57	14337.	44.9	3.5	0.17	0.57	14523.
		1.35-1.40	7.1	9.5	0.20	0.60	13544.	52.1	4.4	0.17	0.58	14389.
		1.40-1.50	8.6	16.2	0.25	0.62	12462.	60.7	6.0	0.18	0.58	14115.
		1.50-1.60	4.9	20.1	0.27	0.59	10846.	65.6	7.5	0.19	0.58	13869.
		1.60-1.70	2.6	34.2	0.32	0.65	9521.	68.3	8.6	0.19	0.59	13703.
		1.70-1.80	1.7	43.2	0.51	0.71	8051.	69.9	9.4	0.20	0.59	13567.
		SINK 1.80	30.1	73.6	0.46	0.48	4000.	100.0	28.7	0.28	0.56	10692.
2 BY 1	41.1 PERCENT	FLOAT 1.30	27.1	2.5	0.14	0.58	14685.	27.1	2.5	0.14	0.58	14685.
		1.30-1.35	21.6	4.7	0.17	0.62	14337.	48.7	3.5	0.15	0.60	14531.
		1.35-1.40	7.9	9.5	0.19	0.69	13551.	56.5	4.3	0.16	0.61	14394.
		1.40-1.50	8.6	16.0	0.26	0.62	12484.	65.1	5.9	0.17	0.61	14143.
		1.50-1.60	4.7	25.6	0.30	0.60	10931.	69.7	7.2	0.18	0.61	13929.
		1.60-1.70	2.6	33.6	0.33	1.14	9616.	72.4	8.2	0.18	0.63	13771.
		1.70-1.80	1.8	42.9	0.59	1.36	8101.	74.2	9.0	0.19	0.65	13633.
		SINK 1.80	25.8	70.0	0.60	0.62	4000.	100.0	24.7	0.30	0.64	11148.
1 BY 3/8	1.7 PERCENT	FLOAT 1.30	30.5	2.4	0.13	0.58	14712.	30.5	2.4	0.13	0.58	14712.
		1.30-1.35	22.6	4.6	0.14	0.58	14345.	53.1	3.3	0.13	0.58	14556.
		1.35-1.40	7.7	9.3	0.21	0.63	13582.	60.8	4.1	0.14	0.59	14433.
		1.40-1.50	8.2	15.8	0.27	0.63	12526.	68.9	5.5	0.16	0.59	14207.
		1.50-1.60	4.2	25.1	0.32	0.60	11016.	73.2	6.6	0.17	0.59	14023.
		1.60-1.70	2.4	33.4	0.39	0.90	9650.	75.6	7.5	0.17	0.60	13883.
		1.70-1.80	1.8	42.2	0.67	1.04	8222.	77.4	8.3	0.18	0.61	13751.
		SINK 1.80	22.6	68.8	0.78	0.79	4000.	100.0	22.0	0.32	0.65	11546.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	25.5	2.6	0.13	0.58	14684.	25.5	2.6	0.13	0.58	14684.
		1.30-1.35	21.1	4.7	0.19	0.59	14337.	46.6	3.5	0.16	0.58	14527.
		1.35-1.40	7.4	9.5	0.20	0.64	13548.	54.1	4.3	0.17	0.59	14392.
		1.40-1.50	8.6	16.1	0.25	0.62	12472.	62.7	6.0	0.18	0.60	14128.
		1.50-1.60	4.8	25.9	0.28	0.59	10883.	67.5	7.4	0.18	0.60	13898.
		1.60-1.70	2.6	34.0	0.33	0.86	9563.	70.1	8.4	0.19	0.61	13735.
		1.70-1.80	1.7	43.1	0.54	0.99	8077.	71.8	9.2	0.20	0.61	13598.
		SINK 1.80	28.2	72.2	0.52	0.54	4000.	100.0	26.9	0.29	0.59	10894.

FLOWSTREAM SUMMARY

FLOWRATE = 55.8 PERCENT OF FEED ASH = 26.9 PERCENT PYRITIC SULFUR = .29 PERCENT TOTAL SULFUR = .59 PERCENT

BTU CONTENT = 10894. BTU/LB

SO2 CONTENT = 1.09 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 5

ORIGIN = UNIT NUMBER 2 L DESTINATION = UNIT NUMBER 5

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT HEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT HEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	38.5 PERCENT	FLOAT 1.30	30.5	2.4	0.13	0.58	14712.	30.5	2.4	0.13	0.58	14712.
		1.30-1.35	22.6	4.6	0.14	0.58	14345.	53.1	3.3	0.13	0.58	14556.
		1.35-1.40	7.7	9.3	0.21	0.63	13582.	60.8	4.1	0.14	0.59	14433.
		1.40-1.50	8.2	15.8	0.27	0.63	12526.	68.9	5.5	0.16	0.59	14207.
		1.50-1.60	4.2	25.1	0.32	0.60	11016.	73.2	6.6	0.17	0.59	14023.
		1.60-1.70	2.4	33.4	0.39	0.90	9650.	75.6	7.5	0.17	0.60	13883.
		1.70-1.80	1.8	42.2	0.67	1.04	8222.	77.4	8.3	0.18	0.61	13751.
		SINK 1.80	22.6	68.8	0.78	0.79	4000.	100.0	22.0	0.32	0.65	11546.
3/8 BY 28	30.2 PERCENT	FLOAT 1.30	36.2	2.3	0.11	0.59	14718.	36.2	2.3	0.11	0.59	14718.
		1.30-1.35	22.9	4.6	0.15	0.59	14345.	59.0	3.2	0.12	0.59	14573.
		1.35-1.40	7.8	9.3	0.23	0.63	13580.	66.8	3.9	0.14	0.59	14457.
		1.40-1.50	8.0	15.8	0.27	0.62	12527.	74.8	5.2	0.15	0.60	14250.
		1.50-1.60	4.2	25.0	0.32	0.61	11024.	79.0	6.3	0.16	0.60	14081.
		1.60-1.70	2.4	33.4	0.41	0.86	9657.	81.4	7.1	0.17	0.60	13949.
		1.70-1.80	1.8	42.2	0.67	1.03	8229.	83.2	7.8	0.18	0.61	13827.
		SINK 1.80	16.8	61.4	1.14	1.17	5099.	100.0	16.8	0.34	0.71	12360.
28 BY 48	16.4 PERCENT	FLOAT 1.30	40.3	2.1	0.12	0.59	14756.	40.3	2.1	0.12	0.59	14756.
		1.30-1.35	22.4	4.5	0.16	0.60	14363.	62.7	3.0	0.13	0.59	14616.
		1.35-1.40	7.4	9.2	0.22	0.64	13599.	70.1	3.6	0.14	0.59	14508.
		1.40-1.50	7.4	15.7	0.28	0.63	12534.	77.5	4.8	0.16	0.60	14320.
		1.50-1.60	3.8	25.0	0.34	0.62	11026.	81.3	5.7	0.16	0.60	14167.
		1.60-1.70	2.2	33.5	0.44	0.87	9638.	83.5	6.5	0.17	0.61	14045.
		1.70-1.80	1.7	42.2	0.69	1.01	8224.	85.2	7.2	0.18	0.61	13932.
		SINK 1.80	14.8	61.0	1.32	1.34	5163.	100.0	15.1	0.35	0.72	12632.
48 BY 0	15.0 PERCENT	FLOAT 1.30	49.5	17.9	0.30	0.66	12179.	49.5	17.9	0.30	0.66	12179.
		1.30-1.35	20.6	17.8	0.30	0.66	12201.	70.1	17.9	0.30	0.66	12185.
		1.35-1.40	5.5	18.2	0.31	0.66	12139.	75.6	17.9	0.30	0.66	12182.
		1.40-1.50	5.4	19.8	0.32	0.66	11878.	81.0	18.0	0.30	0.66	12162.
		1.50-1.60	2.3	22.1	0.34	0.66	11506.	83.3	18.1	0.30	0.66	12144.
		1.60-1.70	2.0	23.3	0.36	0.70	11297.	85.3	18.3	0.30	0.66	12123.
		1.70-1.80	1.1	26.4	0.43	0.75	10804.	86.4	18.4	0.30	0.66	12106.
		SINK 1.80	13.6	20.8	0.58	0.89	11715.	100.0	18.7	0.34	0.69	12053.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	36.7	5.5	0.15	0.60	14209.	36.7	5.5	0.15	0.60	14209.
		1.30-1.35	22.3	6.4	0.17	0.60	14052.	59.0	5.8	0.16	0.60	14150.
		1.35-1.40	7.3	10.3	0.23	0.64	13424.	66.3	6.3	0.17	0.60	14069.
		1.40-1.50	7.6	16.2	0.28	0.63	12459.	73.9	7.3	0.18	0.61	13904.
		1.50-1.60	3.8	24.8	0.32	0.61	11064.	77.8	8.2	0.19	0.61	13764.
		1.60-1.70	2.3	32.1	0.40	0.86	9867.	80.1	8.9	0.19	0.61	13651.
		1.70-1.80	1.7	40.6	0.65	1.00	8484.	81.8	9.5	0.20	0.62	13545.
		SINK 1.80	18.2	60.3	0.93	0.98	5320.	100.0	18.8	0.33	0.69	12045.

FLOWSTREAM SUMMARY

FLOWRATE = 27.4 PERCENT OF FEED ASH = 18.8 PERCENT PYRITIC SULFUR = .33 PERCENT TOTAL SULFUR = .69 PERCENT

BTU CONTENT = 12046. BTU/LB

SO2 CONTENT = 1.14 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 6

ORIGIN = UNIT NUMBER 3 C DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	52.7 PERCENT	FLOAT 1.30	45.7	2.6	0.13	0.57	14682.	45.7	2.6	0.13	0.57	14682.
		1.30-1.35	36.9	4.7	0.21	0.57	14337.	82.6	3.5	0.17	0.57	14528.
		1.35-1.40	10.6	9.5	0.20	0.60	13544.	93.2	4.2	0.17	0.58	14416.
		1.40-1.50	6.4	16.2	0.25	0.62	12462.	99.6	5.0	0.18	0.58	14291.
		1.50-1.60	0.4	26.1	0.27	0.59	10846.	99.9	5.0	0.18	0.58	14278.
		1.60-1.70	0.1	34.2	0.32	0.65	9521.	100.0	5.1	0.18	0.58	14275.
		1.70-1.80	0.0	43.2	0.51	0.71	8051.	100.0	5.1	0.18	0.58	14275.
		SINK 1.80	0.0	73.6	0.46	0.48	4000.	100.0	5.1	0.18	0.58	14275.
2 BY 1	45.2 PERCENT	FLOAT 1.30	42.8	2.5	0.14	0.58	14685.	42.8	2.5	0.14	0.58	14685.
		1.30-1.35	33.5	4.7	0.17	0.62	14337.	76.3	3.5	0.15	0.60	14532.
		1.35-1.40	11.6	9.5	0.19	0.69	13551.	87.8	4.3	0.16	0.61	14402.
		1.40-1.50	8.7	16.0	0.26	0.62	12484.	96.5	5.3	0.17	0.61	14230.
		1.50-1.60	2.4	25.6	0.30	0.60	10931.	98.9	5.8	0.17	0.61	14151.
		1.60-1.70	0.6	33.6	0.33	1.14	9616.	99.5	6.0	0.17	0.62	14123.
		1.70-1.80	0.1	42.9	0.59	1.36	8101.	99.6	6.0	0.17	0.62	14116.
		SINK 1.80	0.4	70.0	0.60	0.62	4000.	100.0	6.3	0.17	0.62	14077.
1 BY 3/8	2.0 PERCENT	FLOAT 1.30	43.5	2.4	0.13	0.58	14712.	43.5	2.4	0.13	0.58	14712.
		1.30-1.35	31.9	4.6	0.14	0.58	14345.	75.4	3.3	0.13	0.58	14557.
		1.35-1.40	10.5	9.3	0.21	0.63	13582.	85.9	4.1	0.14	0.59	14438.
		1.40-1.50	8.9	15.8	0.27	0.63	12526.	94.8	5.2	0.15	0.59	14298.
		1.50-1.60	2.9	25.1	0.32	0.60	11016.	97.7	5.8	0.16	0.59	14161.
		1.60-1.70	0.9	33.4	0.39	0.90	9650.	98.6	6.0	0.16	0.60	14119.
		1.70-1.80	0.3	42.2	0.67	1.04	8222.	98.9	6.1	0.16	0.60	14102.
		SINK 1.80	1.1	68.8	0.78	0.79	4000.	100.0	6.8	0.17	0.60	13993.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	44.3	2.6	0.13	0.58	14684.	44.3	2.6	0.13	0.58	14684.
		1.30-1.35	35.2	4.7	0.19	0.59	14337.	79.6	3.5	0.16	0.58	14530.
		1.35-1.40	11.0	9.5	0.20	0.64	13548.	90.6	4.2	0.16	0.59	14411.
		1.40-1.50	7.5	16.1	0.25	0.62	12475.	98.1	5.1	0.17	0.59	14263.
		1.50-1.60	1.3	25.6	0.29	0.60	10923.	99.4	5.4	0.17	0.59	14219.
		1.60-1.70	0.3	33.7	0.33	1.07	9612.	99.7	5.5	0.17	0.60	14203.
		1.70-1.80	0.1	42.7	0.59	1.30	8137.	99.8	5.5	0.17	0.60	14200.
		SINK 1.80	0.2	69.7	0.62	0.64	4026.	100.0	5.7	0.17	0.60	14179.

FLOWSTREAM SUMMARY

FLOWRATE = 32.1 PERCENT OF FEED ASH = 5.7 PERCENT PYRITIC SULFUR = .17 PERCENT TOTAL SULFUR = .60 PERCENT

BTU CONTENT = 14179. BTU/LB

SO2 CONTENT = 0.84 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 7

ORIGIN = UNIT NUMBER 3 M DESTINATION = UNIT NUMBER 4

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	62.5 PERCENT	FLOAT 1.30	0.5	2.6	0.13	0.57	14682.	0.5	2.6	0.13	0.57	14682.
		1.30-1.35	3.2	4.7	0.21	0.57	14337.	3.7	4.4	0.20	0.57	14385.
		1.35-1.40	6.0	9.5	0.20	0.60	13544.	9.7	7.6	0.20	0.59	13868.
		1.40-1.50	19.1	16.2	0.25	0.62	12462.	28.8	13.3	0.23	0.61	12936.
		1.50-1.60	15.3	26.1	0.27	0.59	10846.	44.1	17.7	0.24	0.60	12211.
		1.60-1.70	7.1	34.2	0.32	0.65	9521.	51.1	20.0	0.25	0.61	11839.
		1.70-1.80	3.9	43.2	0.51	0.71	8051.	55.1	21.7	0.27	0.61	11568.
		SINK 1.80	44.9	73.6	0.46	0.48	4000.	100.0	45.0	0.36	0.56	8168.
2 BY 1	36.2 PERCENT	FLOAT 1.30	0.2	2.5	0.14	0.58	14685.	0.2	2.5	0.14	0.58	14685.
		1.30-1.35	2.0	4.7	0.17	0.62	14337.	2.2	4.5	0.17	0.62	14372.
		1.35-1.40	2.4	9.5	0.19	0.69	13551.	4.7	7.1	0.18	0.65	13941.
		1.40-1.50	12.7	16.0	0.26	0.62	12484.	17.4	13.7	0.24	0.63	12874.
		1.50-1.60	12.6	25.6	0.30	0.60	10931.	30.0	18.7	0.26	0.61	12057.
		1.60-1.70	7.9	33.6	0.33	1.14	9616.	38.0	21.8	0.28	0.72	11546.
		1.70-1.80	5.5	42.9	0.59	1.36	8101.	43.5	24.5	0.32	0.80	11111.
		SINK 1.80	56.5	70.0	0.60	0.62	4000.	100.0	50.2	0.48	0.70	7090.
1 BY 3/8	1.3 PERCENT	FLOAT 1.30	0.6	2.4	0.13	0.58	14712.	0.6	2.4	0.13	0.58	14712.
		1.30-1.35	2.4	4.6	0.14	0.58	14345.	3.0	4.2	0.14	0.58	14418.
		1.35-1.40	2.3	9.3	0.21	0.63	13582.	5.3	6.4	0.17	0.60	14050.
		1.40-1.50	10.6	15.8	0.27	0.63	12526.	15.9	12.7	0.24	0.62	13033.
		1.50-1.60	10.8	25.1	0.32	0.60	11016.	26.7	17.7	0.27	0.61	12217.
		1.60-1.70	7.7	33.4	0.39	0.90	9650.	34.4	21.2	0.30	0.67	11641.
		1.70-1.80	6.2	42.2	0.67	1.04	8222.	40.6	24.4	0.35	0.73	11119.
		SINK 1.80	59.4	68.8	0.78	0.79	4000.	100.0	50.8	0.60	0.76	6888.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	0.4	2.6	0.13	0.58	14683.	0.4	2.6	0.13	0.58	14683.
		1.30-1.35	2.8	4.7	0.20	0.59	14337.	3.2	4.4	0.19	0.58	14382.
		1.35-1.40	4.6	9.5	0.20	0.62	13546.	7.8	7.5	0.20	0.60	13885.
		1.40-1.50	16.7	16.1	0.25	0.62	12469.	24.5	13.4	0.23	0.61	12921.
		1.50-1.60	14.3	25.9	0.28	0.59	10875.	38.8	18.0	0.25	0.60	12168.
		1.60-1.70	7.4	34.0	0.33	0.84	9560.	46.2	20.6	0.26	0.64	11750.
		1.70-1.80	4.5	43.1	0.55	1.00	8077.	50.7	22.6	0.29	0.67	11422.
		SINK 1.80	49.3	72.0	0.53	0.54	4001.	100.0	46.9	0.40	0.61	7762.

FLOWSTREAM SUMMARY

FLOWRATE = 9.0 PERCENT OF FEED ASH = 46.9 PERCENT PYRITIC SULFUR = .40 PERCENT TOTAL SULFUR = .61 PERCENT

BTU CONTENT = 7762. BTU/LB

SO2 CONTENT = 1.57 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 8

ORIGIN = UNIT NUMBER 3 R DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	63.6 PERCENT	FLOAT 1.30	0.0	2.6	0.13	0.57	14682.	0.0	2.6	0.13	0.57	14682.
		1.30-1.35	2.1	4.7	0.21	0.57	14337.	2.1	4.7	0.21	0.57	14337.
		1.35-1.40	1.7	9.5	0.20	0.60	13544.	3.8	6.8	0.21	0.59	13988.
		1.40-1.50	6.4	16.2	0.25	0.62	12462.	10.2	12.7	0.23	0.60	13030.
		1.50-1.60	6.9	26.1	0.27	0.59	10846.	17.1	18.1	0.25	0.60	12145.
		1.60-1.70	4.5	34.2	0.32	0.65	9521.	21.6	21.5	0.26	0.61	11596.
		1.70-1.80	3.3	43.2	0.51	0.71	8051.	25.0	24.4	0.29	0.62	11121.
		SINK 1.80	75.0	73.6	0.46	0.48	4000.	100.0	61.3	0.42	0.52	5779.
2 BY 1	35.2 PERCENT	FLOAT 1.30	0.3	2.5	0.14	0.58	14685.	0.3	2.5	0.14	0.58	14685.
		1.30-1.35	0.6	4.7	0.17	0.62	14337.	0.9	4.1	0.16	0.61	14439.
		1.35-1.40	0.9	9.5	0.19	0.69	13551.	1.7	6.8	0.18	0.65	13994.
		1.40-1.50	5.6	16.0	0.26	0.62	12484.	7.4	13.9	0.24	0.63	12841.
		1.50-1.60	6.1	25.6	0.30	0.60	10931.	13.4	19.1	0.26	0.61	11979.
		1.60-1.70	5.0	33.6	0.33	1.14	9616.	18.4	23.1	0.28	0.75	11338.
		1.70-1.80	4.2	42.9	0.59	1.36	8101.	22.7	26.8	0.34	0.87	10734.
		SINK 1.80	77.3	70.0	0.60	0.62	4000.	100.0	60.2	0.54	0.68	5527.
1 BY 3/8	1.2 PERCENT	FLOAT 1.30	0.6	2.4	0.13	0.58	14712.	0.6	2.4	0.13	0.58	14712.
		1.30-1.35	0.5	4.6	0.14	0.58	14345.	1.1	3.4	0.13	0.58	14545.
		1.35-1.40	0.6	9.3	0.21	0.63	13582.	1.7	5.4	0.16	0.60	14221.
		1.40-1.50	3.7	15.8	0.27	0.63	12526.	5.4	12.5	0.23	0.62	13067.
		1.50-1.60	4.7	25.1	0.32	0.60	11016.	10.1	18.3	0.27	0.61	12109.
		1.60-1.70	4.7	33.4	0.39	0.90	9650.	14.8	23.1	0.31	0.70	11333.
		1.70-1.80	4.7	42.2	0.67	1.04	8222.	19.4	27.7	0.40	0.78	10588.
		SINK 1.80	80.6	68.8	0.78	0.79	4000.	100.0	60.8	0.70	0.79	5280.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	0.1	2.5	0.13	0.58	14687.	0.1	2.5	0.13	0.58	14687.
		1.30-1.35	1.6	4.7	0.20	0.58	14337.	1.7	4.6	0.20	0.58	14357.
		1.35-1.40	1.4	9.5	0.20	0.62	13546.	3.0	6.8	0.20	0.60	13991.
		1.40-1.50	6.1	16.1	0.25	0.62	12470.	9.1	13.0	0.23	0.61	12977.
		1.50-1.60	6.6	25.9	0.28	0.59	10875.	15.7	18.4	0.25	0.60	12095.
		1.60-1.70	4.7	34.0	0.33	0.84	9559.	20.4	22.0	0.27	0.66	11512.
		1.70-1.80	3.7	43.1	0.54	0.98	8075.	24.1	25.2	0.31	0.71	10988.
		SINK 1.80	75.9	72.2	0.52	0.54	4000.	100.0	60.9	0.47	0.58	5685.

FLOWSTREAM SUMMARY

FLOWRATE = 14.8 PERCENT OF FEED ASH = 60.9 PERCENT PYRITIC SULFUR = .47 PERCENT TOTAL SULFUR = .58 PERCENT

BTU CONTENT = 5685. BTU/LB

SO2 CONTENT = 2.03 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 9

ORIGIN = UNIT NUMBER 4 DESTINATION = UNIT NUMBER 5

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
3/8 BY 28	5.9 PERCENT	FLOAT 1.30	0.4	2.6	0.13	0.58	14683.	0.4	2.6	0.13	0.58	14683.
		1.30-1.35	2.8	4.7	0.20	0.59	14337.	3.2	4.4	0.19	0.58	14382.
		1.35-1.40	4.6	9.5	0.20	0.62	13546.	7.8	7.5	0.20	0.60	13885.
		1.40-1.50	16.7	16.1	0.25	0.62	12469.	24.5	13.4	0.23	0.61	12921.
		1.50-1.60	14.3	25.9	0.28	0.59	10876.	38.7	18.0	0.25	0.60	12168.
		1.60-1.70	7.4	34.0	0.33	0.84	9561.	46.1	20.6	0.26	0.64	11750.
		1.70-1.80	4.5	43.1	0.55	1.00	8077.	50.7	22.6	0.29	0.68	11421.
		SINK 1.80	49.3	72.0	0.53	0.54	4000.	100.0	47.0	0.40	0.61	7759.
28 BY 48	84.1 PERCENT	FLOAT 1.30	0.4	2.6	0.13	0.58	14683.	0.4	2.6	0.13	0.58	14683.
		1.30-1.35	2.8	4.7	0.20	0.59	14337.	3.2	4.4	0.19	0.58	14382.
		1.35-1.40	4.6	9.5	0.20	0.62	13546.	7.8	7.5	0.20	0.60	13885.
		1.40-1.50	16.7	16.1	0.25	0.62	12469.	24.5	13.4	0.23	0.61	12921.
		1.50-1.60	14.3	25.9	0.28	0.59	10875.	38.8	18.0	0.25	0.60	12168.
		1.60-1.70	7.4	34.0	0.33	0.84	9560.	46.2	20.5	0.26	0.64	11750.
		1.70-1.80	4.5	43.1	0.55	1.00	8077.	50.7	22.6	0.29	0.67	11422.
		SINK 1.80	49.3	72.0	0.53	0.54	4000.	100.0	46.9	0.40	0.61	7762.
48 BY 0	10.0 PERCENT	FLOAT 1.30	0.4	2.6	0.13	0.58	14679.	0.4	2.6	0.13	0.58	14679.
		1.30-1.35	2.8	4.7	0.20	0.59	14337.	3.2	4.4	0.19	0.58	14381.
		1.35-1.40	4.6	9.5	0.20	0.62	13546.	7.8	7.5	0.20	0.60	13885.
		1.40-1.50	16.7	16.1	0.25	0.62	12469.	24.5	13.4	0.23	0.61	12921.
		1.50-1.60	14.3	25.9	0.28	0.59	10876.	38.7	18.0	0.25	0.60	12168.
		1.60-1.70	7.4	34.0	0.33	0.84	9561.	46.1	20.6	0.26	0.64	11750.
		1.70-1.80	4.5	43.1	0.55	1.00	8078.	50.7	22.6	0.29	0.68	11421.
		SINK 1.80	49.3	72.0	0.53	0.54	4000.	100.0	46.9	0.40	0.61	7760.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	0.4	2.6	0.13	0.57	14683.	0.4	2.6	0.13	0.57	14683.
		1.30-1.35	2.8	4.7	0.20	0.58	14337.	3.2	4.4	0.19	0.58	14382.
		1.35-1.40	4.6	9.5	0.20	0.62	13546.	7.8	7.5	0.20	0.60	13885.
		1.40-1.50	16.7	16.1	0.25	0.62	12469.	24.5	13.4	0.23	0.61	12921.
		1.50-1.60	14.3	25.9	0.28	0.59	10876.	38.8	18.0	0.25	0.60	12168.
		1.60-1.70	7.4	34.0	0.33	0.84	9561.	46.2	20.5	0.26	0.64	11751.
		1.70-1.80	4.5	43.1	0.55	1.00	8078.	50.7	22.6	0.29	0.67	11422.
		SINK 1.80	49.3	72.0	0.53	0.54	4000.	100.0	46.9	0.40	0.61	7762.

FLOWSTREAM SUMMARY

FLOWRATE = 9.0 PERCENT OF FEED ASH = 46.9 PERCENT PYRITIC SULFUR = .40 PERCENT TOTAL SULFUR = .61 PERCENT

BTU CONTENT = 7762. BTU/LB

SO2 CONTENT = 1.57 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 10

ORIGIN = UNIT NUMBER 5 DESTINATION = UNIT NUMBER 6

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	29.0 PERCENT	FLOAT 1.30	30.5	2.4	0.13	0.58	14712.	30.5	2.4	0.13	0.58	14712.
		1.30-1.35	22.6	4.6	0.14	0.58	14345.	53.1	3.3	0.13	0.58	14556.
		1.35-1.40	7.7	9.3	0.21	0.63	13582.	60.8	4.1	0.14	0.59	14433.
		1.40-1.50	8.2	15.8	0.27	0.63	12526.	68.9	5.5	0.16	0.59	14207.
		1.50-1.60	4.2	25.1	0.32	0.60	11016.	73.2	6.6	0.17	0.59	14023.
		1.60-1.70	2.4	33.4	0.39	0.90	9650.	75.6	7.5	0.17	0.60	13883.
		1.70-1.80	1.8	42.2	0.67	1.04	8222.	77.4	8.3	0.18	0.61	13751.
		SINK 1.80	22.6	68.8	0.78	0.79	4000.	100.0	22.0	0.32	0.65	11546.
3/8 BY 28	24.2 PERCENT	FLOAT 1.30	34.0	2.3	0.11	0.59	14718.	34.0	2.3	0.11	0.59	14718.
		1.30-1.35	21.7	4.6	0.15	0.59	14345.	55.7	3.2	0.13	0.59	14573.
		1.35-1.40	7.6	9.3	0.23	0.63	13579.	63.3	4.0	0.14	0.59	14453.
		1.40-1.50	8.5	15.8	0.27	0.62	12520.	71.8	5.4	0.15	0.60	14223.
		1.50-1.60	4.8	25.2	0.31	0.61	10997.	76.6	6.6	0.16	0.60	14023.
		1.60-1.70	2.7	33.5	0.40	0.86	9641.	79.3	7.5	0.17	0.61	13873.
		1.70-1.80	1.9	42.3	0.65	1.03	8208.	81.2	8.4	0.18	0.62	13737.
		SINK 1.80	18.8	63.0	1.04	1.07	4826.	100.0	18.6	0.34	0.70	12066.
28 BY 48	33.1 PERCENT	FLOAT 1.30	15.3	2.1	0.12	0.59	14755.	15.3	2.1	0.12	0.59	14755.
		1.30-1.35	10.1	4.6	0.17	0.59	14358.	25.3	3.1	0.14	0.59	14597.
		1.35-1.40	5.7	9.4	0.21	0.63	13572.	31.0	4.2	0.15	0.60	14409.
		1.40-1.50	13.2	16.1	0.26	0.62	12482.	44.2	7.8	0.18	0.60	13834.
		1.50-1.60	10.4	25.8	0.29	0.59	10896.	54.6	11.2	0.20	0.60	13276.
		1.60-1.70	5.5	33.9	0.34	0.85	9572.	60.1	13.3	0.22	0.62	12938.
		1.70-1.80	3.5	42.9	0.57	1.00	8103.	63.5	14.9	0.23	0.64	12675.
		SINK 1.80	36.5	70.3	0.65	0.66	4000.	100.0	35.1	0.38	0.65	9511.
48 BY 0	13.7 PERCENT	FLOAT 1.30	40.7	17.9	0.30	0.66	12183.	40.7	17.9	0.30	0.66	12183.
		1.30-1.35	17.4	17.4	0.30	0.65	12262.	58.1	17.7	0.30	0.66	12207.
		1.35-1.40	5.3	16.8	0.29	0.65	12361.	63.4	17.7	0.29	0.66	12220.
		1.40-1.50	7.4	18.3	0.29	0.64	12116.	70.8	17.7	0.29	0.65	12209.
		1.50-1.60	4.4	24.3	0.30	0.62	11142.	75.3	18.1	0.29	0.65	12146.
		1.60-1.70	3.0	28.0	0.34	0.77	10526.	78.3	18.5	0.30	0.66	12084.
		1.70-1.80	1.7	34.2	0.48	0.87	9518.	80.0	18.8	0.30	0.66	12028.
		SINK 1.80	20.0	43.5	0.55	0.74	8012.	100.0	23.8	0.35	0.68	11225.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	27.7	5.5	0.15	0.60	14211.	27.7	5.5	0.15	0.60	14211.
		1.30-1.35	17.5	6.4	0.17	0.60	14063.	45.2	5.8	0.16	0.60	14154.
		1.35-1.40	6.7	10.2	0.22	0.63	13445.	51.9	6.4	0.17	0.60	14063.
		1.40-1.50	9.8	16.2	0.27	0.62	12463.	61.7	7.9	0.18	0.61	13808.
		1.50-1.60	6.4	25.4	0.30	0.60	10961.	68.1	9.6	0.19	0.61	13540.
		1.60-1.70	3.6	33.1	0.36	0.85	9711.	71.7	10.7	0.20	0.62	13349.
		1.70-1.80	2.4	41.8	0.60	1.00	8293.	74.1	11.7	0.22	0.63	13186.
		SINK 1.80	25.9	65.8	0.74	0.77	4570.	100.0	25.7	0.35	0.67	10954.

FLOWSTREAM SUMMARY

FLOWRATE = 36.4 PERCENT OF FEED ASH = 25.8 PERCENT PYRITIC SULFUR = .35 PERCENT TOTAL SULFUR = .67 PERCENT

BTU CONTENT = 10954. BTU/LB

SO2 CONTENT = 1.22 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 11

ORIGIN = UNIT NUMBER 6 U DESTINATION = UNIT NUMBER 7

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	32.5 PERCENT	FLOAT 1.30	30.5	2.4	0.13	0.58	14712.	30.5	2.4	0.13	0.58	14712.
		1.30-1.35	22.6	4.6	0.14	0.58	14345.	53.1	3.3	0.13	0.58	14556.
		1.35-1.40	7.7	9.3	0.21	0.63	13582.	60.8	4.1	0.14	0.59	14433.
		1.40-1.50	8.2	15.8	0.27	0.63	12526.	68.9	5.5	0.16	0.59	14207.
		1.50-1.60	4.2	25.1	0.32	0.60	11016.	73.2	6.6	0.17	0.59	14023.
		1.60-1.70	2.4	33.4	0.39	0.90	9650.	75.6	7.5	0.17	0.60	13883.
		1.70-1.80	1.8	42.2	0.67	1.04	8222.	77.4	8.3	0.18	0.61	13751.
		SINK 1.80	22.6	68.8	0.78	0.79	4000.	100.0	22.0	0.32	0.65	11546.
3/8 BY 28	27.1 PERCENT	FLOAT 1.30	34.0	2.3	0.11	0.59	14718.	34.0	2.3	0.11	0.59	14718.
		1.30-1.35	21.7	4.6	0.15	0.59	14345.	55.7	3.2	0.13	0.59	14573.
		1.35-1.40	7.6	9.3	0.23	0.63	13579.	63.3	4.0	0.14	0.59	14453.
		1.40-1.50	8.5	15.8	0.27	0.62	12520.	71.8	5.4	0.15	0.60	14223.
		1.50-1.60	4.8	25.2	0.31	0.61	10997.	76.6	6.6	0.16	0.60	14023.
		1.60-1.70	2.7	33.5	0.40	0.86	9641.	79.3	7.5	0.17	0.61	13873.
		1.70-1.80	1.9	42.3	0.65	1.03	8208.	81.2	8.4	0.18	0.62	13737.
		SINK 1.80	18.8	63.0	1.04	1.07	4826.	100.0	18.6	0.34	0.70	12066.
28 BY 48	31.3 PERCENT	FLOAT 1.30	15.3	2.1	0.12	0.59	14755.	15.3	2.1	0.12	0.59	14755.
		1.30-1.35	10.1	4.6	0.17	0.59	14358.	25.3	3.1	0.14	0.59	14597.
		1.35-1.40	5.7	9.4	0.21	0.63	13572.	31.0	4.2	0.15	0.60	14409.
		1.40-1.50	13.2	16.1	0.26	0.62	12482.	44.2	7.8	0.18	0.60	13834.
		1.50-1.60	10.4	25.8	0.29	0.59	10896.	54.6	11.2	0.20	0.60	13276.
		1.60-1.70	5.5	33.9	0.34	0.85	9572.	60.1	13.3	0.22	0.62	12938.
		1.70-1.80	3.5	42.9	0.57	1.00	8103.	63.5	14.9	0.23	0.64	12675.
		SINK 1.80	36.5	70.3	0.65	0.66	4000.	100.0	35.1	0.38	0.65	9511.
48 BY 0	9.1 PERCENT	FLOAT 1.30	40.7	17.9	0.30	0.66	12183.	40.7	17.9	0.30	0.66	12183.
		1.30-1.35	17.4	17.4	0.30	0.65	12262.	58.1	17.7	0.30	0.66	12207.
		1.35-1.40	5.3	16.8	0.29	0.65	12361.	63.4	17.7	0.29	0.66	12220.
		1.40-1.50	7.4	18.3	0.29	0.64	12116.	70.8	17.7	0.29	0.65	12209.
		1.50-1.60	4.4	24.3	0.30	0.62	11142.	75.3	18.1	0.29	0.65	12146.
		1.60-1.70	3.0	28.0	0.34	0.77	10528.	78.3	18.5	0.30	0.66	12084.
		1.70-1.80	1.7	34.2	0.48	0.87	9518.	80.0	18.8	0.30	0.66	12028.
		SINK 1.80	20.0	43.5	0.55	0.74	8012.	100.0	23.8	0.35	0.68	11225.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	27.6	4.4	0.14	0.59	14381.	27.6	4.4	0.14	0.59	14381.
		1.30-1.35	17.9	5.8	0.16	0.59	14162.	45.6	4.9	0.15	0.59	14295.
		1.35-1.40	6.8	9.9	0.22	0.63	13492.	52.4	5.6	0.16	0.60	14190.
		1.40-1.50	9.8	16.1	0.26	0.62	12478.	62.2	7.2	0.18	0.60	13921.
		1.50-1.60	6.3	25.4	0.30	0.60	10959.	68.5	8.9	0.19	0.60	13648.
		1.60-1.70	3.5	33.3	0.37	0.86	9680.	72.0	10.1	0.20	0.61	13454.
		1.70-1.80	2.4	42.0	0.61	1.01	8253.	74.3	11.1	0.21	0.63	13290.
		SINK 1.80	25.7	66.5	0.75	0.79	4449.	100.0	25.3	0.35	0.67	11021.

FLOWSTREAM SUMMARY

FLOWRATE = 32.5 PERCENT OF FEED ASH = 25.3 PERCENT PYRITIC SULFUR = .35 PERCENT TOTAL SULFUR = .67 PERCENT

BTU CONTENT = 11021. BTU/LB

SO2 CONTENT = 1.21 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 12

ORIGIN = UNIT NUMBER 6 L DESTINATION = UNIT NUMBER 8

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
28 BY 48	48.0 PERCENT	FLOAT 1.30	15.3	2.1	0.12	0.59	14755.	15.3	2.1	0.12	0.59	14755.
		1.30-1.35	10.1	4.6	0.17	0.59	14358.	25.3	3.1	0.14	0.59	14597.
		1.35-1.40	5.7	9.4	0.21	0.63	13572.	31.0	4.2	0.15	0.60	14409.
		1.40-1.50	13.2	16.1	0.26	0.62	12482.	44.2	7.8	0.18	0.60	13834.
		1.50-1.60	10.4	25.8	0.29	0.59	10896.	54.6	11.2	0.20	0.60	13276.
		1.60-1.70	5.5	33.9	0.34	0.85	9572.	60.1	13.3	0.22	0.62	12938.
		1.70-1.80	3.5	42.9	0.57	1.00	8103.	63.5	14.9	0.23	0.64	12675.
		SINK 1.80	36.5	70.3	0.65	0.66	4000.	100.0	35.1	0.38	0.65	9511.
48 BY 0	52.0 PERCENT	FLOAT 1.30	40.7	17.9	0.30	0.66	12183.	40.7	17.9	0.30	0.66	12183.
		1.30-1.35	17.4	17.4	0.30	0.65	12262.	58.1	17.7	0.30	0.66	12207.
		1.35-1.40	5.3	16.8	0.29	0.65	12361.	63.4	17.7	0.29	0.66	12220.
		1.40-1.50	7.4	18.3	0.29	0.64	12116.	70.8	17.7	0.29	0.65	12209.
		1.50-1.60	4.4	24.3	0.30	0.62	11142.	75.3	18.1	0.29	0.65	12146.
		1.60-1.70	3.0	28.0	0.34	0.77	10528.	78.3	18.5	0.30	0.66	12084.
		1.70-1.80	1.7	34.2	0.48	0.87	9518.	80.0	18.8	0.30	0.66	12028.
		SINK 1.80	20.0	43.5	0.55	0.74	8012.	100.0	23.8	0.35	0.68	11225.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	28.5	13.8	0.25	0.64	12846.	28.5	13.8	0.25	0.64	12846.
		1.30-1.35	13.9	12.9	0.25	0.63	12992.	42.4	13.5	0.25	0.64	12894.
		1.35-1.40	5.5	13.1	0.25	0.64	12963.	47.8	13.5	0.25	0.64	12902.
		1.40-1.50	10.2	16.9	0.27	0.63	12344.	58.0	14.1	0.25	0.64	12804.
		1.50-1.60	7.3	25.3	0.29	0.60	10974.	65.3	15.3	0.26	0.63	12600.
		1.60-1.70	4.2	31.7	0.34	0.82	9929.	69.5	16.3	0.26	0.64	12438.
		1.70-1.80	2.6	39.9	0.54	0.95	8601.	72.1	17.2	0.27	0.65	12302.
		SINK 1.80	27.9	60.3	0.61	0.69	5494.	100.0	29.2	0.37	0.66	10402.

FLOWSTREAM SUMMARY

FLOWRATE = 3.9 PERCENT OF FEED ASH = 29.2 PERCENT PYRITIC SULFUR = .37 PERCENT TOTAL SULFUR = .66 PERCENT

BTU CONTENT = 10402. BTU/LB

SO2 CONTENT = 1.28 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 13

ORIGIN = UNIT NUMBER 7 C DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	34.9 PERCENT	FLOAT 1.30	47.0	2.4	0.13	0.58	14712.	47.0	2.4	0.13	0.58	14712.
		1.30-1.35	34.1	4.6	0.14	0.58	14345.	81.0	3.3	0.13	0.58	14557.
		1.35-1.40	10.5	9.3	0.21	0.63	13582.	91.5	4.0	0.14	0.59	14446.
		1.40-1.50	7.3	15.8	0.27	0.63	12526.	98.8	4.9	0.15	0.59	14304.
		1.50-1.60	1.1	25.1	0.32	0.60	11016.	99.9	5.1	0.15	0.59	14269.
		1.60-1.70	0.1	33.4	0.39	0.90	9650.	99.9	5.1	0.15	0.59	14266.
		1.70-1.80	0.1	42.2	0.67	1.04	8222.	100.0	5.1	0.15	0.59	14263.
		SINK 1.80	0.0	68.8	0.78	0.79	4000.	100.0	5.1	0.15	0.59	14263.
3/8 BY 28	30.2 PERCENT	FLOAT 1.30	50.1	2.3	0.11	0.59	14718.	50.1	2.3	0.11	0.59	14718.
		1.30-1.35	30.9	4.6	0.15	0.59	14345.	81.0	3.2	0.12	0.59	14575.
		1.35-1.40	9.9	9.3	0.23	0.63	13579.	91.0	3.9	0.14	0.59	14467.
		1.40-1.50	7.3	15.8	0.27	0.62	12520.	98.2	4.8	0.15	0.59	14323.
		1.50-1.60	1.4	25.2	0.31	0.61	10997.	99.7	5.1	0.15	0.59	14275.
		1.60-1.70	0.2	33.5	0.40	0.86	9641.	99.9	5.1	0.15	0.59	14266.
		1.70-1.80	0.1	42.3	0.65	1.03	8208.	99.9	5.1	0.15	0.60	14262.
		SINK 1.80	0.1	63.0	1.04	1.07	4826.	100.0	5.2	0.15	0.60	14256.
28 BY 48	23.2 PERCENT	FLOAT 1.30	32.1	2.1	0.12	0.59	14755.	32.1	2.1	0.12	0.59	14755.
		1.30-1.35	20.1	4.6	0.17	0.59	14358.	52.2	3.1	0.14	0.59	14602.
		1.35-1.40	10.3	9.4	0.21	0.63	13572.	62.5	4.1	0.15	0.60	14432.
		1.40-1.50	19.7	16.1	0.26	0.62	12482.	82.2	7.0	0.18	0.60	13965.
		1.50-1.60	10.6	25.8	0.29	0.59	10896.	92.9	9.1	0.19	0.60	13613.
		1.60-1.70	3.4	33.9	0.34	0.85	9572.	96.3	10.0	0.19	0.61	13469.
		1.70-1.80	1.2	42.9	0.57	1.00	8103.	97.5	10.4	0.20	0.61	13403.
		SINK 1.80	2.5	70.3	0.65	0.66	4000.	100.0	11.9	0.21	0.62	13167.
48 BY 0	11.7 PERCENT	FLOAT 1.30	51.0	17.9	0.30	0.66	12183.	51.0	17.9	0.30	0.66	12183.
		1.30-1.35	21.5	17.4	0.30	0.65	12262.	72.5	17.8	0.30	0.66	12207.
		1.35-1.40	6.4	16.8	0.29	0.65	12361.	79.0	17.7	0.29	0.66	12219.
		1.40-1.50	8.7	18.3	0.29	0.64	12116.	87.6	17.7	0.29	0.65	12209.
		1.50-1.60	4.6	24.3	0.30	0.62	11142.	92.2	18.1	0.29	0.65	12156.
		1.60-1.70	2.5	28.0	0.34	0.77	10528.	94.8	18.3	0.30	0.66	12112.
		1.70-1.80	1.1	34.2	0.48	0.87	9518.	95.8	18.5	0.30	0.66	12083.
		SINK 1.80	4.2	43.5	0.55	0.74	8012.	100.0	19.6	0.31	0.66	11913.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	44.9	4.4	0.14	0.59	14384.	44.9	4.4	0.14	0.59	14384.
		1.30-1.35	28.4	5.8	0.16	0.59	14162.	73.4	4.9	0.15	0.59	14298.
		1.35-1.40	9.8	9.9	0.22	0.63	13485.	83.2	5.5	0.16	0.60	14202.
		1.40-1.50	10.3	16.2	0.27	0.62	12465.	93.5	6.7	0.17	0.60	14010.
		1.50-1.60	3.8	25.4	0.29	0.60	10954.	97.3	7.4	0.17	0.60	13891.
		1.60-1.70	1.2	32.4	0.35	0.83	9819.	98.5	7.7	0.18	0.60	13842.
		1.70-1.80	0.4	40.4	0.55	0.97	8513.	98.9	7.9	0.18	0.61	13819.
		SINK 1.80	1.1	58.2	0.61	0.70	5815.	100.0	8.4	0.18	0.61	13731.

FLOWSTREAM SUMMARY

FLOWRATE = 19.5 PERCENT OF FEED ASH = 8.4 PERCENT PYRITIC SULFUR = .18 PERCENT TOTAL SULFUR = .61 PERCENT

BTU CONTENT = 13731. BTU/LB

SO2 CONTENT = 0.68 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 14

ORIGIN = UNIT NUMBER 7 R DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	28.9 PERCENT	FLOAT 1.30	0.5	2.4	0.13	0.58	14712.	0.5	2.4	0.13	0.58	14712.
		1.30-1.35	1.6	4.6	0.14	0.58	14345.	2.1	4.1	0.14	0.58	14435.
		1.35-1.40	2.5	9.3	0.21	0.63	13582.	4.6	7.0	0.18	0.61	13965.
		1.40-1.50	9.8	15.8	0.27	0.63	12526.	14.4	13.0	0.24	0.62	12986.
		1.50-1.60	10.0	25.1	0.32	0.60	11016.	24.4	17.9	0.27	0.61	12179.
		1.60-1.70	6.7	33.4	0.39	0.90	9650.	31.1	21.3	0.30	0.67	11635.
		1.70-1.80	5.0	42.2	0.67	1.04	8222.	36.1	24.2	0.35	0.72	11161.
		SINK 1.80	63.9	68.8	0.78	0.79	4000.	100.0	52.7	0.62	0.76	6584.
3/8 BY 28	22.3 PERCENT	FLOAT 1.30	1.1	2.3	0.11	0.59	14718.	1.1	2.3	0.11	0.59	14718.
		1.30-1.35	2.8	4.6	0.15	0.59	14345.	3.9	4.0	0.14	0.59	14451.
		1.35-1.40	2.9	9.3	0.23	0.63	13579.	6.7	6.3	0.18	0.61	14081.
		1.40-1.50	11.1	15.8	0.27	0.62	12520.	17.9	12.2	0.23	0.61	13108.
		1.50-1.60	11.6	25.2	0.31	0.61	10997.	29.4	17.3	0.26	0.61	12277.
		1.60-1.70	7.9	33.5	0.40	0.86	9641.	37.3	20.7	0.29	0.66	11721.
		1.70-1.80	5.8	42.3	0.65	1.03	8208.	43.1	23.6	0.34	0.71	11250.
		SINK 1.80	56.9	63.0	1.04	1.07	4826.	100.0	46.1	0.74	0.92	7593.
28 BY 48	43.6 PERCENT	FLOAT 1.30	1.8	2.1	0.12	0.59	14755.	1.8	2.1	0.12	0.59	14755.
		1.30-1.35	2.0	4.6	0.17	0.59	14358.	3.8	3.4	0.14	0.59	14546.
		1.35-1.40	1.9	9.4	0.21	0.63	13572.	5.7	5.4	0.17	0.60	14215.
		1.40-1.50	8.0	16.1	0.26	0.62	12482.	13.7	11.6	0.22	0.61	13205.
		1.50-1.60	10.2	25.8	0.29	0.59	10896.	23.9	17.6	0.25	0.60	12224.
		1.60-1.70	7.1	33.9	0.34	0.85	9572.	31.0	21.4	0.27	0.66	11615.
		1.70-1.80	5.3	42.9	0.57	1.00	8103.	36.3	24.5	0.31	0.71	11105.
		SINK 1.80	63.7	70.3	0.65	0.66	4000.	100.0	53.7	0.53	0.68	6578.
48 BY 0	5.2 PERCENT	FLOAT 1.30	5.6	17.9	0.30	0.66	12183.	5.6	17.9	0.30	0.66	12183.
		1.30-1.35	3.4	17.4	0.30	0.65	12262.	9.0	17.7	0.30	0.66	12213.
		1.35-1.40	1.5	16.8	0.29	0.65	12361.	10.5	17.6	0.29	0.66	12233.
		1.40-1.50	3.2	18.3	0.29	0.64	12116.	13.7	17.8	0.29	0.65	12206.
		1.50-1.60	3.8	24.3	0.30	0.62	11142.	17.6	19.2	0.30	0.65	11973.
		1.60-1.70	4.6	28.0	0.34	0.77	10528.	22.2	21.0	0.31	0.67	11672.
		1.70-1.80	4.0	34.2	0.48	0.87	9518.	26.2	23.1	0.33	0.70	11342.
		SINK 1.80	73.8	43.5	0.55	0.74	8012.	100.0	38.1	0.50	0.73	8884.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	1.5	5.3	0.15	0.60	14230.	1.5	5.3	0.15	0.60	14230.
		1.30-1.35	2.1	5.7	0.17	0.60	14175.	3.6	5.5	0.16	0.60	14198.
		1.35-1.40	2.3	9.6	0.22	0.63	13537.	5.9	7.1	0.18	0.61	13940.
		1.40-1.50	9.0	16.0	0.26	0.62	12500.	14.8	12.5	0.23	0.62	13070.
		1.50-1.60	10.1	25.4	0.30	0.60	10961.	24.9	17.7	0.26	0.61	12216.
		1.60-1.70	7.0	33.5	0.37	0.86	9644.	32.0	21.2	0.28	0.67	11651.
		1.70-1.80	5.2	42.2	0.61	1.01	8220.	37.2	24.1	0.33	0.71	11167.
		SINK 1.80	62.8	66.8	0.76	0.79	4413.	100.0	50.9	0.60	0.76	6927.

FLOWSTREAM SUMMARY

FLOWRATE = 12.9 PERCENT OF FEED ASH = 50.9 PERCENT PYRITIC SULFUR = .60 PERCENT TOTAL SULFUR = .76 PERCENT

BTU CONTENT = 6927. BTU/LB

SO2 CONTENT = 2.19 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 15

ORIGIN = UNIT NUMBER 8 C DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
28 BY 48	35.8 PERCENT	FLOAT 1.30	27.1	2.1	0.12	0.59	14755.	27.1	2.1	0.12	0.59	14755.
		1.30-1.35	23.0	4.6	0.17	0.59	14358.	50.1	3.2	0.14	0.59	14573.
		1.35-1.40	12.0	9.4	0.21	0.63	13572.	62.2	4.4	0.15	0.60	14379.
		1.40-1.50	21.7	16.1	0.26	0.62	12482.	83.8	7.4	0.18	0.60	13888.
		1.50-1.60	10.7	25.8	0.29	0.59	10896.	94.6	9.5	0.19	0.60	13548.
		1.60-1.70	2.9	33.9	0.34	0.85	9572.	97.5	10.2	0.20	0.61	13432.
		1.70-1.80	0.9	42.9	0.57	1.00	8103.	98.4	10.5	0.20	0.61	13382.
		SINK 1.80	1.6	70.3	0.65	0.66	4000.	100.0	11.5	0.21	0.61	13229.
48 BY 0	64.2 PERCENT	FLOAT 1.30	57.2	17.9	0.30	0.66	12183.	57.2	17.9	0.30	0.66	12183.
		1.30-1.35	23.9	17.4	0.30	0.65	12262.	81.0	17.8	0.30	0.66	12206.
		1.35-1.40	7.6	16.8	0.29	0.65	12361.	88.6	17.7	0.29	0.66	12220.
		1.40-1.50	7.1	18.3	0.29	0.64	12116.	95.7	17.7	0.29	0.65	12212.
		1.50-1.60	2.7	24.3	0.30	0.62	11142.	98.4	17.9	0.29	0.65	12183.
		1.60-1.70	0.9	28.0	0.34	0.77	10528.	99.2	18.0	0.30	0.65	12169.
		1.70-1.80	0.3	34.2	0.48	0.87	9518.	99.5	18.0	0.30	0.66	12162.
		SINK 1.80	0.5	43.5	0.55	0.74	8012.	100.0	18.2	0.30	0.66	12141.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	46.4	14.6	0.26	0.64	12722.	46.4	14.6	0.26	0.64	12722.
		1.30-1.35	23.5	12.9	0.25	0.63	12995.	70.0	14.0	0.26	0.64	12814.
		1.35-1.40	9.2	13.3	0.25	0.64	12931.	79.1	13.9	0.26	0.64	12827.
		1.40-1.50	12.3	16.9	0.27	0.63	12347.	91.5	14.3	0.26	0.64	12762.
		1.50-1.60	5.6	25.3	0.29	0.60	10972.	97.0	15.0	0.26	0.64	12660.
		1.60-1.70	1.6	31.9	0.34	0.82	9907.	98.6	15.2	0.26	0.64	12616.
		1.70-1.80	0.5	40.0	0.54	0.96	8583.	99.1	15.4	0.26	0.64	12596.
		SINK 1.80	0.9	60.7	0.61	0.69	5437.	100.0	15.8	0.27	0.64	12531.

FLOWSTREAM SUMMARY

FLOWRATE = 2.2 PERCENT OF FEED ASH = 15.8 PERCENT PYRITIC SULFUR = .27 PERCENT TOTAL SULFUR = .64 PERCENT

BTU CONTENT = 12531. BTU/LB

SO2 CONTENT = 1.02 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF FLOWSTREAM NUMBER 16

ORIGIN = UNIT NUMBER 8 R DESTINATION = UNIT NUMBER 0

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
28 BY 48	64.1 PERCENT	FLOAT 1.30	6.6	2.1	0.12	0.59	14755.	6.6	2.1	0.12	0.59	14755.
		1.30-1.35	0.6	4.6	0.17	0.59	14358.	7.1	2.3	0.12	0.59	14723.
		1.35-1.40	1.0	9.4	0.21	0.63	13572.	8.1	3.2	0.13	0.59	14581.
		1.40-1.50	7.0	16.1	0.26	0.62	12482.	15.1	9.1	0.19	0.60	13611.
		1.50-1.60	10.1	25.8	0.29	0.59	10896.	25.2	15.8	0.23	0.60	12524.
		1.60-1.70	7.4	33.9	0.34	0.85	9572.	32.6	19.9	0.25	0.66	11684.
		1.70-1.80	5.3	42.9	0.57	1.00	8103.	37.9	23.1	0.30	0.71	11327.
		SINK 1.80	62.1	70.3	0.65	0.66	4000.	100.0	52.4	0.51	0.68	6779.
48 BY 0	35.9 PERCENT	FLOAT 1.30	2.0	17.9	0.30	0.66	12183.	2.0	17.9	0.30	0.66	12183.
		1.30-1.35	2.2	17.4	0.30	0.65	12262.	4.2	17.6	0.30	0.66	12225.
		1.35-1.40	0.0	16.8	0.29	0.65	12361.	4.2	17.6	0.30	0.66	12225.
		1.40-1.50	8.1	18.3	0.29	0.64	12116.	12.3	18.1	0.29	0.65	12153.
		1.50-1.60	8.6	24.3	0.30	0.62	11142.	21.0	20.6	0.30	0.64	11737.
		1.60-1.70	8.0	28.0	0.34	0.77	10528.	29.0	22.7	0.31	0.67	11402.
		1.70-1.80	5.2	34.2	0.48	0.87	9518.	34.2	24.4	0.34	0.70	11117.
		SINK 1.80	65.8	43.5	0.55	0.74	8012.	100.0	37.0	0.48	0.72	9073.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	4.9	4.4	0.14	0.60	14383.	4.9	4.4	0.14	0.60	14383.
		1.30-1.35	1.2	13.4	0.26	0.63	12920.	6.1	6.1	0.16	0.60	14104.
		1.35-1.40	0.6	9.4	0.21	0.63	13572.	6.7	6.4	0.17	0.61	14053.
		1.40-1.50	7.4	16.9	0.27	0.63	12338.	14.1	11.9	0.22	0.62	13154.
		1.50-1.60	9.6	25.3	0.29	0.60	10976.	23.7	17.3	0.25	0.61	12274.
		1.60-1.70	7.6	31.7	0.34	0.82	9935.	31.3	20.8	0.27	0.66	11704.
		1.70-1.80	5.3	39.9	0.54	0.95	8604.	36.6	23.6	0.31	0.70	11257.
		SINK 1.80	63.4	60.3	0.61	0.69	5496.	100.0	46.9	0.50	0.70	7603.

FLOWSTREAM SUMMARY

FLOWRATE = 1.7 PERCENT OF FEED ASH = 46.9 PERCENT PYRITIC SULFUR = .50 PERCENT TOTAL SULFUR = .70 PERCENT

BTU CONTENT = 7603. BTU/LB

SO2 CONTENT = 1.83 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT FROM UNIT NUMBER 3

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	52.7 PERCENT	FLOAT 1.30	45.7	2.6	0.13	0.57	14682.	45.7	2.6	0.13	0.57	14682.
		1.30-1.35	36.9	4.7	0.21	0.57	14337.	82.6	3.5	0.17	0.57	14528.
		1.35-1.40	10.6	9.5	0.20	0.60	13544.	93.2	4.2	0.17	0.58	14416.
		1.40-1.50	6.4	16.2	0.25	0.62	12462.	99.6	5.0	0.18	0.58	14291.
		1.50-1.60	0.4	26.1	0.27	0.59	10846.	99.9	5.0	0.18	0.58	14278.
		1.60-1.70	0.1	34.2	0.32	0.65	9521.	100.0	5.1	0.18	0.58	14275.
		1.70-1.80	0.0	43.2	0.51	0.71	8051.	100.0	5.1	0.18	0.58	14275.
		SINK 1.80	0.0	73.6	0.46	0.48	4000.	100.0	5.1	0.18	0.58	14275.
2 BY 1	45.2 PERCENT	FLOAT 1.30	42.8	2.5	0.14	0.58	14685.	42.8	2.5	0.14	0.58	14685.
		1.30-1.35	33.5	4.7	0.17	0.62	14337.	76.3	3.5	0.15	0.60	14532.
		1.35-1.40	11.6	9.5	0.19	0.69	13551.	87.8	4.3	0.16	0.61	14402.
		1.40-1.50	8.7	16.0	0.26	0.62	12484.	96.5	5.3	0.17	0.61	14230.
		1.50-1.60	2.4	25.6	0.30	0.60	10931.	98.9	5.8	0.17	0.61	14151.
		1.60-1.70	0.6	33.6	0.33	1.14	9616.	99.5	6.0	0.17	0.62	14123.
		1.70-1.80	0.1	42.9	0.59	1.36	8101.	99.6	6.0	0.17	0.62	14116.
		SINK 1.80	0.4	70.0	0.60	0.62	4000.	100.0	6.3	0.17	0.62	14077.
1 BY 3/8	2.0 PERCENT	FLOAT 1.30	43.5	2.4	0.13	0.58	14712.	43.5	2.4	0.13	0.58	14712.
		1.30-1.35	31.9	4.6	0.14	0.58	14345.	75.4	3.3	0.13	0.58	14557.
		1.35-1.40	10.5	9.3	0.21	0.63	13582.	85.9	4.1	0.14	0.59	14438.
		1.40-1.50	8.9	15.8	0.27	0.63	12526.	94.8	5.2	0.15	0.59	14258.
		1.50-1.60	2.9	25.1	0.32	0.60	11016.	97.7	5.8	0.16	0.59	14161.
		1.60-1.70	0.9	33.4	0.39	0.90	9650.	98.6	6.0	0.16	0.60	14119.
		1.70-1.80	0.3	42.2	0.67	1.04	8222.	98.9	6.1	0.16	0.60	14102.
		SINK 1.80	1.1	68.8	0.78	0.79	4000.	100.0	6.8	0.17	0.60	13993.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	44.3	2.6	0.13	0.58	14684.	44.3	2.6	0.13	0.58	14684.
		1.30-1.35	35.2	4.7	0.19	0.59	14337.	79.6	3.5	0.16	0.58	14530.
		1.35-1.40	11.0	9.5	0.20	0.64	13548.	90.6	4.2	0.16	0.59	14411.
		1.40-1.50	7.5	16.1	0.25	0.62	12475.	98.1	5.1	0.17	0.59	14263.
		1.50-1.60	1.3	25.6	0.29	0.60	10923.	99.4	5.4	0.17	0.59	14219.
		1.60-1.70	0.3	33.7	0.33	1.07	9612.	99.7	5.5	0.17	0.60	14203.
		1.70-1.80	0.1	42.7	0.59	1.30	8137.	99.8	5.5	0.17	0.60	14200.
		SINK 1.80	0.2	69.7	0.62	0.64	4026.	100.0	5.7	0.17	0.60	14179.

FLOWSTREAM SUMMARY

FLOWRATE = 32.1 PERCENT OF FEED ASH = 5.7 PERCENT PYRITIC SULFUR = .17 PERCENT TOTAL SULFUR = .60 PERCENT

BTU CONTENT = 14179. BTU/LB

SO2 CONTENT = 0.84 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT FROM UNIT NUMBER 7

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	34.9 PERCENT	FLOAT 1.30	47.0	2.4	0.13	0.58	14712.	47.0	2.4	0.13	0.58	14712.
		1.30-1.35	34.1	4.6	0.14	0.58	14345.	81.0	3.3	0.13	0.58	14557.
		1.35-1.40	10.5	9.3	0.21	0.63	13582.	91.5	4.0	0.14	0.59	14446.
		1.40-1.50	7.3	15.8	0.27	0.63	12526.	98.8	4.9	0.15	0.59	14304.
		1.50-1.60	1.1	25.1	0.32	0.60	11016.	99.9	5.1	0.15	0.59	14269.
		1.60-1.70	0.1	33.4	0.39	0.90	9650.	99.9	5.1	0.15	0.59	14266.
		1.70-1.80	0.1	42.2	0.67	1.04	8222.	100.0	5.1	0.15	0.59	14263.
		SINK 1.80	0.0	68.8	0.78	0.79	4000.	100.0	5.1	0.15	0.59	14263.
3/8 BY 28	30.2 PERCENT	FLOAT 1.30	50.1	2.3	0.11	0.59	14718.	50.1	2.3	0.11	0.59	14718.
		1.30-1.35	30.9	4.6	0.15	0.59	14345.	81.0	3.2	0.12	0.59	14575.
		1.35-1.40	9.9	9.3	0.23	0.63	13579.	91.0	3.9	0.14	0.59	14467.
		1.40-1.50	7.3	15.8	0.27	0.62	12520.	98.2	4.8	0.15	0.59	14323.
		1.50-1.60	1.4	25.2	0.31	0.61	10997.	99.7	5.1	0.15	0.59	14279.
		1.60-1.70	0.2	33.5	0.40	0.86	9641.	99.9	5.1	0.15	0.59	14266.
		1.70-1.80	0.1	42.3	0.65	1.03	8208.	99.9	5.1	0.15	0.60	14262.
		SINK 1.80	0.1	63.0	1.04	1.07	4826.	100.0	5.2	0.15	0.60	14256.
28 BY 48	23.2 PERCENT	FLOAT 1.30	32.1	2.1	0.12	0.59	14755.	32.1	2.1	0.12	0.59	14755.
		1.30-1.35	20.1	4.6	0.17	0.59	14358.	52.2	3.1	0.14	0.59	14602.
		1.35-1.40	10.3	9.4	0.21	0.63	13572.	62.5	4.1	0.15	0.60	14432.
		1.40-1.50	19.7	14.1	0.26	0.62	12482.	82.2	7.0	0.18	0.60	13965.
		1.50-1.60	10.6	25.8	0.29	0.59	10896.	92.9	9.1	0.19	0.60	13613.
		1.60-1.70	3.4	33.9	0.34	0.85	9572.	96.3	10.0	0.19	0.61	13469.
		1.70-1.80	1.2	42.9	0.57	1.00	8103.	97.5	10.4	0.20	0.61	13403.
		SINK 1.80	2.5	70.3	0.65	0.66	4000.	100.0	11.9	0.21	0.62	13167.
48 BY 0	11.7 PERCENT	FLOAT 1.30	51.0	17.9	0.30	0.66	12183.	51.0	17.9	0.30	0.66	12183.
		1.30-1.35	21.5	17.4	0.30	0.65	12262.	72.5	17.8	0.30	0.66	12207.
		1.35-1.40	6.4	16.8	0.29	0.65	12361.	79.0	17.7	0.29	0.66	12219.
		1.40-1.50	8.7	18.3	0.29	0.64	12116.	87.6	17.7	0.29	0.65	12209.
		1.50-1.60	4.6	24.3	0.30	0.62	11142.	92.2	18.1	0.29	0.65	12156.
		1.60-1.70	2.5	28.0	0.34	0.77	10528.	94.8	18.3	0.30	0.66	12112.
		1.70-1.80	1.1	34.2	0.48	0.87	9518.	95.8	18.5	0.30	0.66	12083.
		SINK 1.80	4.2	43.5	0.55	0.74	8012.	100.0	19.6	0.31	0.66	11913.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	44.9	4.4	0.14	0.59	14384.	44.9	4.4	0.14	0.59	14384.
		1.30-1.35	28.4	5.8	0.16	0.59	14162.	73.4	4.9	0.15	0.59	14298.
		1.35-1.40	9.8	9.9	0.22	0.63	13485.	83.2	5.5	0.16	0.60	14202.
		1.40-1.50	10.3	16.2	0.27	0.62	12465.	93.5	6.7	0.17	0.60	14010.
		1.50-1.60	3.8	25.4	0.29	0.60	10984.	97.3	7.4	0.17	0.60	13891.
		1.60-1.70	1.2	32.4	0.35	0.83	9819.	98.5	7.7	0.18	0.60	13842.
		1.70-1.80	0.4	40.4	0.55	0.97	8513.	98.9	7.9	0.18	0.61	13819.
		SINK 1.80	1.1	58.2	0.61	0.70	5815.	100.0	8.4	0.18	0.61	13731.

FLOWSTREAM SUMMARY

FLOWRATE = 19.5 PERCENT OF FEED ASH = 8.4 PERCENT PYRITIC SULFUR = .18 PERCENT TOTAL SULFUR = .61 PERCENT

BTU CONTENT = 13731. BTU/LB

SO2 CONTENT = 0.88 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF CLEAN COAL PRODUCT FROM UNIT NUMBER 8

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
28 BY 48	35.8 PERCENT	FLOAT 1.30	27.1	2.1	0.12	0.59	14755.	27.1	2.1	0.12	0.59	14755.
		1.30-1.35	23.0	4.6	0.17	0.59	14358.	50.1	3.2	0.14	0.59	14573.
		1.35-1.40	12.0	9.4	0.21	0.63	13572.	62.2	4.4	0.15	0.60	14379.
		1.40-1.50	21.7	16.1	0.26	0.62	12482.	83.8	7.4	0.18	0.60	13688.
		1.50-1.60	10.7	25.8	0.29	0.59	10896.	94.6	9.5	0.19	0.60	13548.
		1.60-1.70	2.9	33.9	0.34	0.85	9572.	97.5	10.2	0.20	0.61	13432.
		1.70-1.80	0.9	42.9	0.57	1.00	8103.	98.4	10.5	0.20	0.61	13382.
		SINK 1.80	1.6	70.3	0.65	0.66	4000.	100.0	11.5	0.21	0.61	13229.
48 BY 0	64.2 PERCENT	FLOAT 1.30	57.2	17.9	0.30	0.66	12183.	57.2	17.9	0.30	0.66	12183.
		1.30-1.35	23.9	17.4	0.30	0.65	12262.	81.0	17.8	0.30	0.66	12206.
		1.35-1.40	7.6	16.8	0.29	0.65	12301.	88.6	17.7	0.29	0.66	12220.
		1.40-1.50	7.1	18.3	0.29	0.64	12116.	95.7	17.7	0.29	0.65	12212.
		1.50-1.60	2.7	24.3	0.30	0.62	11142.	98.4	17.9	0.29	0.65	12183.
		1.60-1.70	0.9	28.0	0.34	0.77	10528.	99.2	18.0	0.30	0.65	12169.
		1.70-1.80	0.3	34.2	0.48	0.87	9518.	99.5	18.0	0.30	0.66	12162.
		SINK 1.80	0.5	43.5	0.55	0.74	8012.	100.0	18.2	0.30	0.66	12141.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	46.4	14.6	0.26	0.64	12722.	46.4	14.6	0.26	0.64	12722.
		1.30-1.35	23.5	12.9	0.25	0.63	12995.	70.0	14.0	0.26	0.64	12814.
		1.35-1.40	9.2	13.3	0.25	0.64	12931.	79.1	13.9	0.26	0.64	12827.
		1.40-1.50	12.3	16.9	0.27	0.63	12347.	91.5	14.3	0.26	0.64	12762.
		1.50-1.60	5.6	25.3	0.29	0.60	10972.	97.0	15.0	0.26	0.64	12660.
		1.60-1.70	1.6	31.9	0.34	0.82	9907.	98.6	15.2	0.26	0.64	12616.
		1.70-1.80	0.5	40.0	0.54	0.96	8583.	99.1	15.4	0.26	0.64	12596.
		SINK 1.80	0.9	60.7	0.61	0.69	5437.	100.0	15.8	0.27	0.64	12531.

FLOWSTREAM SUMMARY

FLOWRATE = 2.2 PERCENT OF FEED ASH = 15.8 PERCENT PYRITIC SULFUR = .27 PERCENT TOTAL SULFUR = .64 PERCENT

BTU CONTENT = 12531. BTU/LB

SO2 CONTENT = 1.02 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 1

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
18 BY 12	24.3 PERCENT	FLOAT 1.30	2.1	2.8	0.08	0.58	14644.	2.1	2.8	0.08	0.58	14644.
		1.30-1.35	1.2	4.4	0.09	0.55	14383.	3.3	3.4	0.08	0.57	14550.
		1.35-1.40	0.2	7.8	0.03	0.46	13829.	3.6	3.7	0.08	0.56	14500.
		1.40-1.50	1.2	15.4	0.13	0.51	12590.	4.8	6.7	0.09	0.55	14013.
		1.50-1.60	0.2	25.0	0.10	0.35	11025.	5.0	7.5	0.09	0.54	13877.
		1.60-1.70	0.2	31.5	0.18	0.44	9966.	5.2	8.4	0.10	0.54	13724.
		1.70-1.80	0.1	41.0	0.17	0.45	8417.	5.3	9.0	0.10	0.53	13637.
		SINK 1.80	94.7	99.1	0.02	0.02	4000.	100.0	98.3	0.02	0.05	4512.
12 BY 6	75.7 PERCENT	FLOAT 1.30	2.5	2.9	0.12	0.56	14632.	2.5	2.9	0.12	0.56	14632.
		1.30-1.35	1.9	4.6	0.11	0.47	14343.	4.4	3.6	0.12	0.52	14506.
		1.35-1.40	0.7	9.2	0.17	0.54	13598.	5.1	4.4	0.13	0.52	14388.
		1.40-1.50	1.0	16.2	0.21	0.61	12462.	6.0	6.2	0.14	0.54	14082.
		1.50-1.60	0.5	26.5	0.21	0.51	10786.	6.5	7.8	0.15	0.53	13821.
		1.60-1.70	0.3	34.3	0.23	0.53	9506.	6.8	9.0	0.15	0.53	13636.
		1.70-1.80	0.2	44.9	0.48	0.66	7781.	7.0	9.8	0.16	0.54	13504.
		SINK 1.80	93.0	98.7	0.02	0.02	4000.	100.0	92.5	0.03	0.06	4663.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	2.4	2.9	0.11	0.56	14634.	2.4	2.9	0.11	0.56	14634.
		1.30-1.35	1.7	4.6	0.11	0.48	14350.	4.1	3.6	0.11	0.53	14514.
		1.35-1.40	0.6	9.0	0.16	0.53	13625.	4.7	4.2	0.12	0.53	14409.
		1.40-1.50	1.0	15.9	0.19	0.58	12501.	5.7	6.3	0.13	0.54	14068.
		1.50-1.60	0.4	26.3	0.20	0.49	10821.	6.2	7.8	0.13	0.54	13833.
		1.60-1.70	0.3	33.7	0.22	0.51	9603.	6.4	8.9	0.14	0.53	13658.
		1.70-1.80	0.1	44.1	0.43	0.62	7907.	6.6	9.6	0.14	0.54	13531.
		SINK 1.80	93.4	98.8	0.02	0.02	4000.	100.0	92.9	0.03	0.06	4627.

FLOWSTREAM SUMMARY

FLOWRATE = 16.8 PERCENT OF FEED ASH = 92.9 PERCENT PYRITIC SULFUR = .03 PERCENT TOTAL SULFUR = .06 PERCENT

BTU CONTENT = 4627. BTU/LB

SO2 CONTENT = 0.24 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 3

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT					CUMULATIVE, PERCENT				
			WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
6 BY 2	63.6 PERCENT	FLOAT 1.30	0.0	2.6	0.13	0.57	14682.	0.0	2.6	0.13	0.57	14682.
		1.30-1.35	2.1	4.7	0.21	0.57	14337.	2.1	4.7	0.21	0.57	14337.
		1.35-1.40	1.7	9.5	0.20	0.60	13544.	3.8	6.8	0.21	0.59	13988.
		1.40-1.50	6.4	16.2	0.25	0.62	12462.	10.2	12.7	0.23	0.60	13030.
		1.50-1.60	6.9	26.1	0.27	0.59	10846.	17.1	18.1	0.25	0.60	12145.
		1.60-1.70	4.5	34.2	0.32	0.65	9521.	21.6	21.5	0.26	0.61	11996.
		1.70-1.80	3.3	43.2	0.51	0.71	8051.	25.0	24.4	0.29	0.62	11121.
		SINK 1.80	75.0	73.6	0.46	0.48	4000.	100.0	61.3	0.42	0.52	5779.
2 BY 1	35.2 PERCENT	FLOAT 1.30	0.3	2.5	0.14	0.58	14685.	0.3	2.5	0.14	0.58	14685.
		1.30-1.35	0.6	4.7	0.17	0.62	14337.	0.9	4.1	0.16	0.61	14439.
		1.35-1.40	0.9	9.5	0.19	0.69	13551.	1.7	6.8	0.18	0.65	13994.
		1.40-1.50	5.6	16.0	0.26	0.62	12484.	7.4	13.9	0.24	0.63	12841.
		1.50-1.60	6.1	25.6	0.30	0.60	10931.	13.4	19.1	0.26	0.61	11979.
		1.60-1.70	5.0	33.6	0.33	1.14	9616.	18.4	23.1	0.28	0.75	11338.
		1.70-1.80	4.2	42.9	0.39	1.36	8101.	22.7	26.8	0.34	0.87	10734.
		SINK 1.80	77.3	70.0	0.60	0.62	4000.	100.0	60.2	0.54	0.68	5527.
1 BY 3/8	1.2 PERCENT	FLOAT 1.30	0.6	2.4	0.13	0.58	14712.	0.6	2.4	0.13	0.58	14712.
		1.30-1.35	0.5	4.6	0.14	0.58	14345.	1.1	3.4	0.13	0.58	14545.
		1.35-1.40	0.6	9.3	0.21	0.63	13582.	1.7	5.4	0.16	0.60	14221.
		1.40-1.50	3.7	15.8	0.27	0.63	12526.	5.4	12.5	0.23	0.62	13067.
		1.50-1.60	4.7	25.1	0.32	0.60	11016.	10.1	18.3	0.27	0.61	12109.
		1.60-1.70	4.7	33.4	0.39	0.90	9650.	14.8	23.1	0.31	0.70	11333.
		1.70-1.80	4.7	42.2	0.67	1.04	8222.	19.4	27.7	0.40	0.78	10588.
		SINK 1.80	80.6	68.8	0.78	0.79	4000.	100.0	60.8	0.70	0.79	5280.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	0.1	2.5	0.13	0.58	14687.	0.1	2.5	0.13	0.58	14687.
		1.30-1.35	1.6	4.7	0.20	0.58	14337.	1.7	4.6	0.20	0.58	14357.
		1.35-1.40	1.4	9.5	0.20	0.62	13546.	3.0	6.8	0.20	0.60	13991.
		1.40-1.50	6.1	16.1	0.25	0.62	12470.	9.1	13.0	0.23	0.61	12977.
		1.50-1.60	6.6	25.9	0.28	0.59	10875.	15.7	18.4	0.25	0.60	12095.
		1.60-1.70	4.7	34.0	0.33	0.84	9559.	20.4	22.0	0.27	0.66	11512.
		1.70-1.80	3.7	43.1	0.54	0.98	8075.	24.1	25.2	0.31	0.71	10988.
		SINK 1.80	75.9	72.2	0.52	0.54	4000.	100.0	60.9	0.47	0.58	5685.

FLOWSTREAM SUMMARY

FLOWRATE = 14.8 PERCENT OF FEED ASH = 60.9 PERCENT PYRITIC SULFUR = .47 PERCENT TOTAL SULFUR = .58 PERCENT

BTU CONTENT = 5685. BTU/LB

SO2 CONTENT = 2.03 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 7

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
1 BY 3/8	28.9 PERCENT	FLOAT 1.30	0.5	2.4	0.13	0.58	14712.	0.5	2.4	0.13	0.58	14712.
		1.30-1.35	1.6	4.6	0.14	0.58	14345.	2.1	4.1	0.14	0.58	14435.
		1.35-1.40	2.5	9.3	0.21	0.63	13582.	4.6	7.0	0.18	0.61	13965.
		1.40-1.50	9.8	15.8	0.27	0.63	12526.	14.4	13.0	0.24	0.62	12986.
		1.50-1.60	10.0	25.1	0.32	0.60	11016.	24.4	17.9	0.27	0.61	12179.
		1.60-1.70	6.7	33.4	0.39	0.90	9680.	31.1	21.3	0.30	0.67	11635.
		1.70-1.80	5.0	42.2	0.67	1.04	8222.	36.1	24.2	0.35	0.72	11161.
		SINK 1.80	63.9	68.8	0.78	0.79	4000.	100.0	52.7	0.62	0.76	6584.
3/8 BY 28	22.3 PERCENT	FLOAT 1.30	1.1	2.3	0.11	0.59	14718.	1.1	2.3	0.11	0.59	14718.
		1.30-1.35	2.8	4.6	0.15	0.59	14345.	3.9	4.0	0.14	0.59	14451.
		1.35-1.40	2.9	9.3	0.23	0.63	13579.	6.7	6.3	0.18	0.61	14081.
		1.40-1.50	11.1	15.8	0.27	0.62	12520.	17.9	12.2	0.23	0.61	13108.
		1.50-1.60	11.6	25.2	0.31	0.61	10997.	29.4	17.3	0.26	0.61	12277.
		1.60-1.70	7.9	33.5	0.40	0.86	9641.	37.3	20.7	0.29	0.66	11721.
		1.70-1.80	5.8	42.3	0.65	1.03	8208.	43.1	23.6	0.34	0.71	11250.
		SINK 1.80	56.9	63.0	1.04	1.07	4826.	100.0	46.1	0.74	0.92	7503.
28 BY 48	43.6 PERCENT	FLOAT 1.30	1.8	2.1	0.12	0.59	14755.	1.8	2.1	0.12	0.59	14755.
		1.30-1.35	2.0	4.6	0.17	0.59	14358.	3.8	3.4	0.14	0.59	14546.
		1.35-1.40	1.9	9.4	0.21	0.63	13572.	5.7	5.4	0.17	0.60	14215.
		1.40-1.50	8.0	16.1	0.26	0.62	12482.	13.7	11.6	0.22	0.61	13205.
		1.50-1.60	10.2	25.8	0.29	0.59	10896.	23.9	17.6	0.25	0.60	12224.
		1.60-1.70	7.1	33.9	0.34	0.85	9572.	31.0	21.4	0.27	0.66	11615.
		1.70-1.80	5.3	42.9	0.57	1.00	8103.	36.3	24.5	0.31	0.71	11105.
		SINK 1.80	63.7	70.3	0.65	0.66	4000.	100.0	53.7	0.53	0.68	6578.
48 BY 0	5.2 PERCENT	FLOAT 1.30	5.6	17.9	0.30	0.66	12183.	5.6	17.9	0.30	0.66	12183.
		1.30-1.35	3.4	17.4	0.30	0.65	12262.	9.0	17.7	0.30	0.66	12213.
		1.35-1.40	1.5	16.8	0.29	0.65	12301.	10.5	17.6	0.29	0.66	12233.
		1.40-1.50	3.2	18.3	0.29	0.64	12116.	13.7	17.8	0.29	0.65	12206.
		1.50-1.60	3.8	24.3	0.30	0.62	11142.	17.6	19.2	0.30	0.65	11973.
		1.60-1.70	4.6	28.0	0.34	0.77	10528.	22.2	21.0	0.31	0.67	11678.
		1.70-1.80	4.0	34.2	0.48	0.87	9518.	26.2	23.1	0.33	0.70	11362.
		SINK 1.80	73.8	43.5	0.55	0.74	8012.	100.0	38.1	0.50	0.73	8884.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	1.5	5.3	0.15	0.60	14230.	1.5	5.3	0.15	0.60	14230.
		1.30-1.35	2.1	5.7	0.17	0.60	14175.	3.6	5.5	0.16	0.60	14198.
		1.35-1.40	2.3	9.6	0.22	0.63	13537.	5.9	7.1	0.18	0.61	13940.
		1.40-1.50	9.0	16.0	0.26	0.62	12500.	14.8	12.5	0.23	0.62	13070.
		1.50-1.60	10.1	25.4	0.30	0.60	10961.	24.9	17.7	0.26	0.61	12216.
		1.60-1.70	7.0	33.5	0.37	0.86	9644.	32.0	21.2	0.28	0.67	11651.
		1.70-1.80	5.2	42.2	0.61	1.01	8220.	37.2	24.1	0.33	0.71	11167.
		SINK 1.80	62.8	66.8	0.76	0.79	4413.	100.0	50.9	0.60	0.76	6927.

FLOWSTREAM SUMMARY

FLOWRATE = 12.9 PERCENT OF FEED ASH = 50.9 PERCENT PYRITIC SULFUR = .60 PERCENT TOTAL SULFUR = .76 PERCENT

BTU CONTENT = 6927. BTU/LB

SO2 CONTENT = 2.19 LBS SO2/MILLION BTU

SPECIFIC GRAVITY ANALYSIS OF REFUSE PRODUCT FROM UNIT NUMBER 8

SIZE FRACTION AND WEIGHT		SPECIFIC GRAVITY	DIRECT, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB	CUMULATIVE, PERCENT WEIGHT	ASH	PYRITIC SULFUR	TOTAL SULFUR	BTU/LB
28 BY 48	64.1 PERCENT	FLOAT 1.30	6.6	2.1	0.12	0.59	14755.	6.6	2.1	0.12	0.59	14755.
		1.30-1.35	0.6	4.6	0.17	0.59	14358.	7.1	2.3	0.12	0.59	14723.
		1.35-1.40	1.0	9.4	0.21	0.63	13572.	8.1	3.2	0.13	0.59	14581.
		1.40-1.50	7.0	16.1	0.26	0.62	12482.	15.1	9.1	0.19	0.60	13611.
		1.50-1.60	10.1	25.8	0.29	0.59	10896.	25.2	15.8	0.23	0.60	12524.
		1.60-1.70	7.4	33.9	0.34	0.85	9572.	32.6	19.9	0.25	0.66	11854.
		1.70-1.80	5.3	42.9	0.57	1.00	8103.	37.9	23.1	0.30	0.71	11327.
		SINK 1.80	62.1	70.3	0.65	0.66	4000.	100.0	52.4	0.51	0.68	6779.
48 BY 0	35.9 PERCENT	FLOAT 1.30	2.0	17.9	0.30	0.66	12183.	2.0	17.9	0.30	0.66	12183.
		1.30-1.35	2.2	17.4	0.30	0.65	12262.	4.2	17.6	0.30	0.66	12225.
		1.35-1.40	0.0	16.8	0.29	0.65	12361.	4.2	17.6	0.30	0.66	12225.
		1.40-1.50	8.1	18.3	0.29	0.68	12116.	12.3	18.1	0.29	0.68	12153.
		1.50-1.60	8.6	24.3	0.30	0.62	11142.	21.0	20.6	0.30	0.66	11737.
		1.60-1.70	8.0	28.0	0.34	0.77	10528.	29.0	22.7	0.31	0.67	11402.
		1.70-1.80	5.2	34.2	0.48	0.87	9518.	34.2	24.4	0.34	0.70	11117.
		SINK 1.80	65.8	43.5	0.55	0.74	8012.	100.0	37.0	0.48	0.72	9073.
COMPOSITE	100.0 PERCENT	FLOAT 1.30	4.9	4.4	0.14	0.60	14383.	4.9	4.4	0.14	0.60	14383.
		1.30-1.35	1.2	13.4	0.26	0.63	12920.	6.1	6.1	0.16	0.60	14104.
		1.35-1.40	0.6	9.4	0.21	0.63	13572.	6.7	6.4	0.17	0.61	14053.
		1.40-1.50	7.4	16.9	0.27	0.63	12338.	14.1	11.9	0.22	0.62	13154.
		1.50-1.60	9.6	25.3	0.29	0.60	10976.	23.7	17.3	0.25	0.61	12274.
		1.60-1.70	7.6	31.7	0.34	0.82	9935.	31.3	20.8	0.27	0.66	11704.
		1.70-1.80	5.3	39.9	0.54	0.95	8604.	36.6	23.6	0.31	0.70	11257.
		SINK 1.80	63.4	60.3	0.61	0.69	5496.	100.0	46.9	0.50	0.70	7603.

FLOWSTREAM SUMMARY

FLOWRATE = 1.7 PERCENT OF FEED ASH = 46.9 PERCENT PYRITIC SULFUR = .50 PERCENT TOTAL SULFUR = .70 PERCENT

BTU CONTENT = 7603. BTU/LB

SO2 CONTENT = 1.83 LBS SO2/MILLION BTU

SUMMARY DATA FOR UNITS

UNIT NUMBER	UNIT TYPE	DECISION VARIABLES			YIELD (PERCENT)	BTU RECOVERY (PERCENT)
1	11 (ROTARY BREAKER)	22.000	5.000	6.000		
2	21 (DRY UPPER SCREEN)		1.000			
3	6 (2-STAGE BAUM JIG)		1.450		57.4	74.8
4	18 (SECONDARY SINGLE ROLL CRUSHER)		0.125			
5	41 (STREAM BLENDER)					
6	21 (DRY UPPER SCREEN)		0.023			
7	1 (CONCENTRATING TABLE)		1.500		60.2	75.0
8	7 (FROTH FLOTATION)				56.8	68.4

SUMMARY DATA FOR FLOWSTREAMS

FLOWSTREAM NUMBER		ORIGIN UNIT NO.	DESTINATION UNIT NO.	FLOWRATE (PERCENT OF FEED)	ASH (PERCENT)	PYRITIC SULFUR (PERCENT)	TOTAL SULFUR (PERCENT)	BTU/LB.	LBS SO2/ MILLION BTU
1	(FEED)	0	1	100.0	35.8	0.26	0.53	10129.	1.04
2	(REFUSE PRODUCT)	1 R	0	16.8	92.9	0.03	0.06	4627.	0.24
3		1 C	2	83.2	24.3	0.30	0.62	11273.	1.11
4		2 U	3	55.8	26.9	0.29	0.59	10894.	1.09
5		2 L	5	27.4	18.8	0.33	0.69	12046.	1.14
6	(CLEAN COAL PRODUCT)	3 C	0	32.1	5.7	0.17	0.60	14179.	0.84
7		3 M	4	9.0	46.9	0.40	0.61	7762.	1.57
8	(REFUSE PRODUCT)	3 R	0	14.8	60.9	0.47	0.58	5685.	2.03
9		4	5	9.0	46.9	0.40	0.61	7762.	1.57
10		5	6	36.4	25.8	0.35	0.67	10954.	1.22
11		6 U	7	32.5	25.3	0.35	0.67	11021.	1.21
12		6 L	8	3.9	29.2	0.37	0.66	10402.	1.28
13	(CLEAN COAL PRODUCT)	7 C	0	19.5	8.4	0.18	0.61	13731.	0.88
14	(REFUSE PRODUCT)	7 R	0	12.9	50.9	0.60	0.76	6927.	2.19
15	(CLEAN COAL PRODUCT)	8 C	0	2.2	15.8	0.27	0.64	12531.	1.02
16	(REFUSE PRODUCT)	8 R	0	1.7	46.9	0.50	0.70	7603.	1.83